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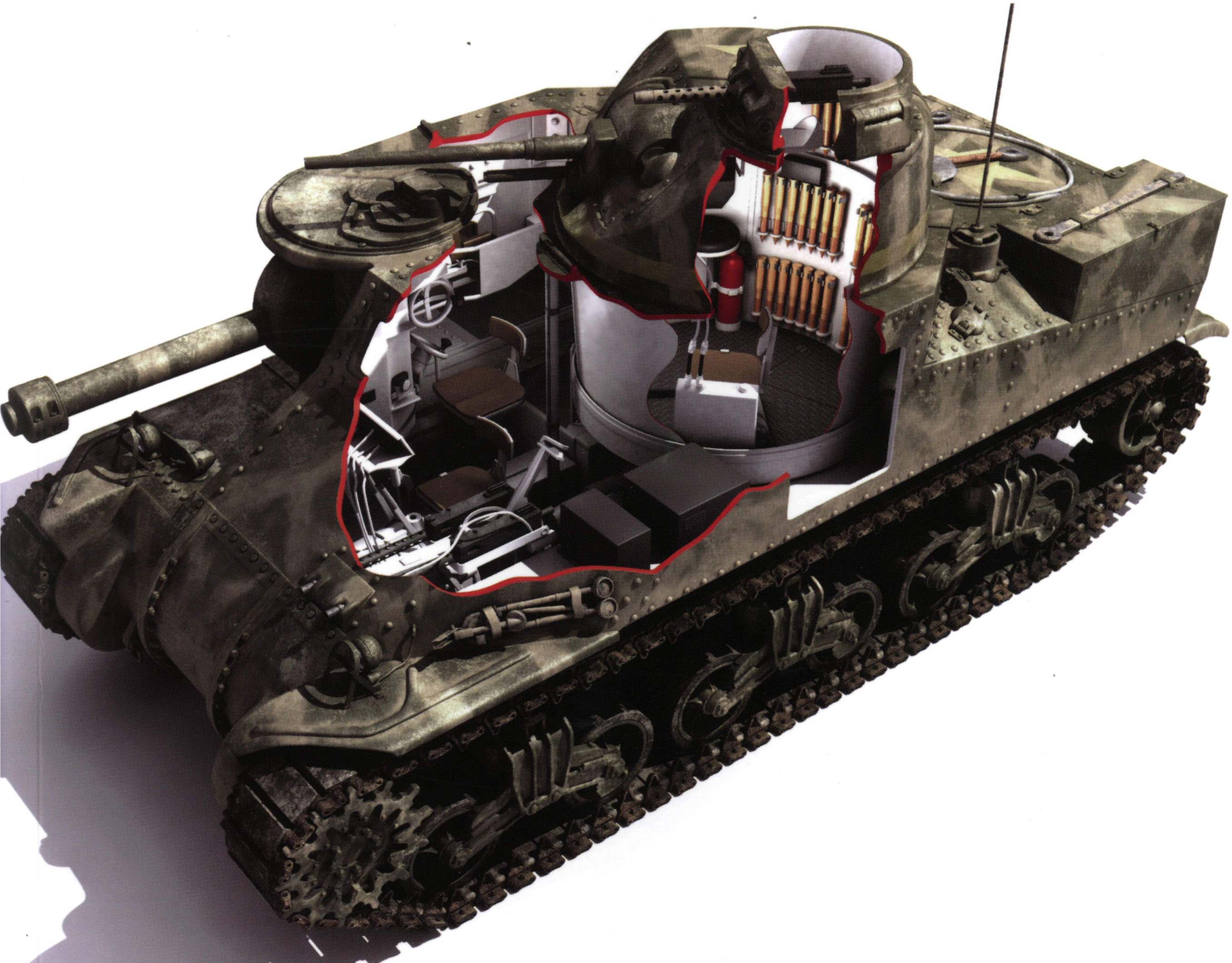
M3 Lee/Grant Medium Tank 1941–45



Steven J Zaloga • Illustrated by Hugh Johnson

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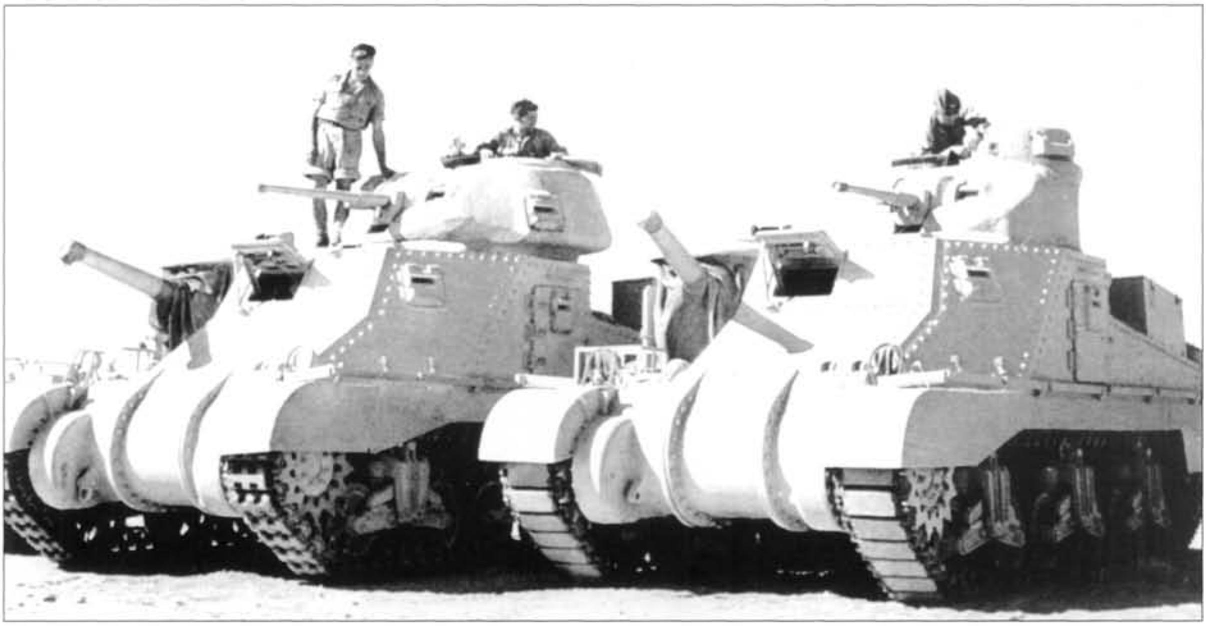
M3 LEE/GRANT MEDIUM TANK 1941–45

INTRODUCTION

The M3 medium tank was rushed into production in 1941 as a stop-gap to satisfy the desperate need for a medium tank in the US and British tank forces. Its design was a messy stew of outdated inter-war design features and time-saving short-cuts. To its credit, it was one of the best-armed tanks of its day and was based on a sound automotive design. The Grant was a godsend to British armored divisions in the spring and summer of 1942 because of its good armor and heavy firepower. The Lee/Grant entered combat at the turning point of the war against Germany in North Africa. It was used by the British Eighth Army in the 1942 battles at Gazala, Alam Halfa, and El Alamein, and later took part with both British and US tank units in the final defeat of the Afrika Korps in Tunisia in 1943. By the time production reached full stride in early 1942, the more mature M4A1 Sherman tank was entering production, which quickly replaced the M3 on the assembly lines. While the M3 disappeared from the tank role in the European theater by mid-1943, it continued to serve in more distant theaters, such as Burma. Its chassis formed the basis for a number of specialized armored vehicles, such as the widely used M31 tank recovery vehicle. The last Lee/Grant tanks remained in service until the mid-1950s in such diverse locations as Brazil and Australia.

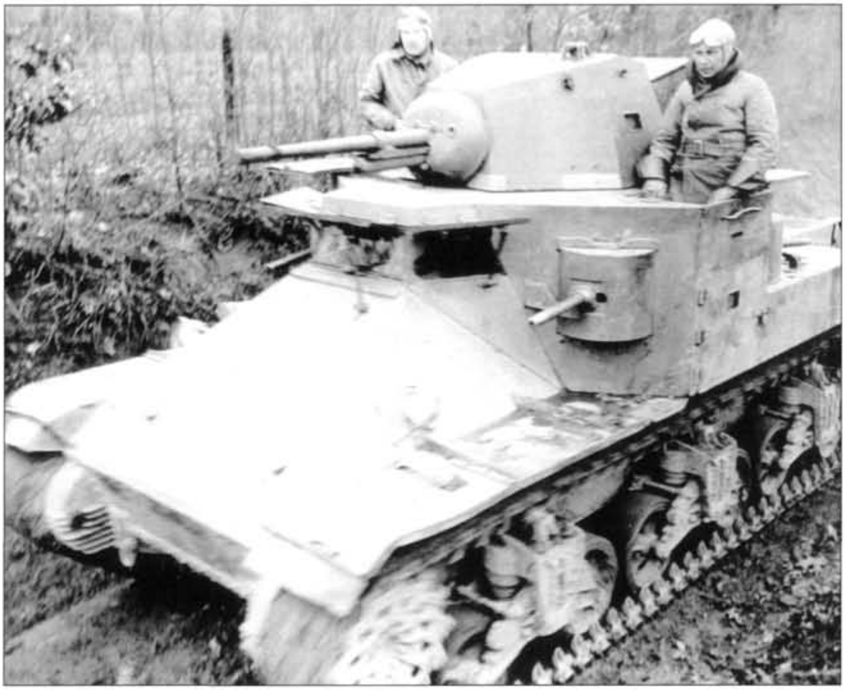


The M3 won its fame in the 1942 desert tank battles. This photograph provides an interesting comparison between the Grant tank on the left with the British-designed turret, and the Lee on the right with the American-designed turret. (Patton Museum)

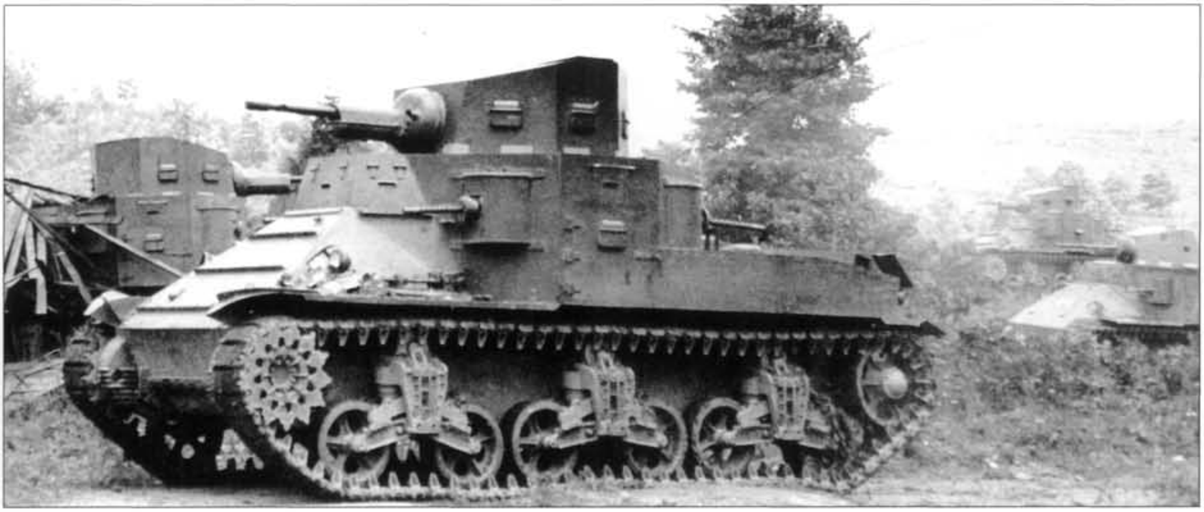
MEDIUM TANK GENESIS

The lack of medium tanks in the US Army in the 1930s was the result of both budget shortages and doctrine. The lingering effects of the Depression and the small size of the pre-war army undermined any attempts to procure medium tanks in quantity. In addition, the presumed role of the US Army to conduct homeland defense and limited military operations in the overseas possessions such as the Philippines did not warrant such expensive weapons. The outbreak of war in Europe in September 1939 forced the United States to rethink its military plans, and funding for army modernization rapidly increased.

The US Army had sponsored some experimental medium tank designs in the 1930s, building five T3E2 medium tanks in 1934, and a further 19 T4s and T4E1s in 1936–37. These medium tanks were armed only with machine guns, and offered few advantages over contemporary light tanks that were half the price. Such shortcomings led the Ordnance Committee to recommend the development of the T5 medium tank in May 1936, a design that was the ancestor of the later M3 and M4 medium tanks. The T5 was essentially a scaled-up M2 light tank, but with a 37mm gun as its principal weapon. Like many inter-war US designs, the T5 had a profusion of machine guns – there were four .30-cal. machine guns in barbettes around the superstructure, two fixed forward-firing machine guns in the bow, and provision for several antiaircraft machine guns. This was a reflection of the contemporary doctrine that saw the medium tank primarily as an infantry support weapon, and the presumption that a large number of machine guns would add to the value of the tank in combat. This concept continued to influence later designs such as the M3 medium tank, though there was little evidence that so many machine guns could be employed effectively in combat.



An M2 medium tank of Co. B, 1/69th Armored Regiment (M), 1st Armored Division, on maneuvers at Ft Knox in 1941. The angled turret on this type proved too cramped and was enlarged on the M2A1. (MHI)



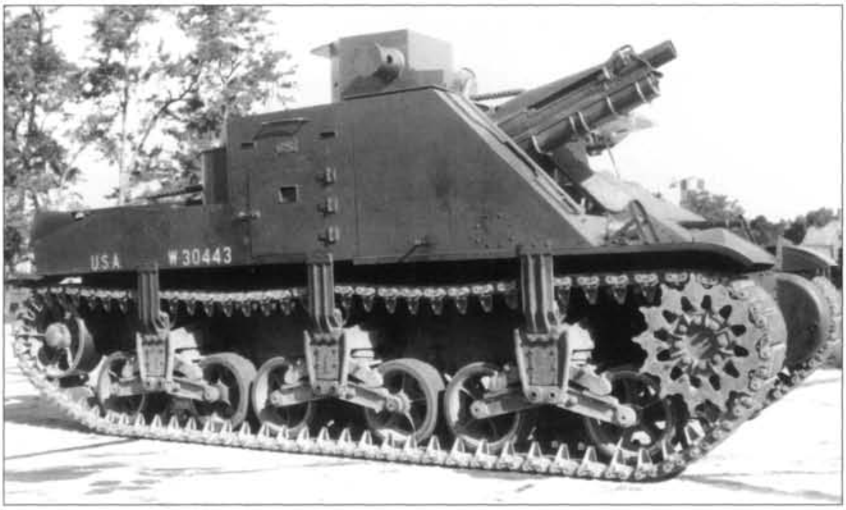
A company of M2A1 medium tanks of the 69th Armored Regiment, 1st Armored Division, conduct a demonstration at Ft Knox in the summer of 1941. One of the older M2 tanks with the early turret can be seen in the background. (MHI)

The T5 Phase I pilot was completed in February 1938 and was shipped to Aberdeen Proving Ground (APG) for trials. One dubious innovation added during the trials was a pair of bullet-deflection plates on the rear of the tank, which permitted the barbette gunners to hit enemy infantry lurking in trenches behind and below. The T5 was accepted for service in the summer of 1938 as the M2 medium tank, the first US medium tank to be standardized in the 1930s.

A significant new influence on American tank design was the Spanish Civil War. The fighting there in 1936–39 suggested that modern antitank guns such as the German 37mm gun would be the primary nemesis of the tank. The M2 had been restricted to a maximum 15 tons weight because of engineer bridge limits, but this limited the thickness of the armor plate to a level insufficient to resist the 37mm gun. As a result, a more thickly armored variant with the weight limit raised to 20 tons, called T5 Phase III, entered trials in the late autumn of 1938 at APG. Besides the thicker armor, there were many other changes, such as a cast turret and a more powerful engine. The infantry was somewhat concerned about the limited high-explosive firepower of the 37mm gun, and noted that European medium tanks such as the French Char B1 bis and the German PzKpfw IV were using short 75mm howitzers for more potent fire support. As a result, the T5 Phase III pilot was rebuilt into the T5E2 configuration by mounting a 75mm howitzer in the right sponson and replacing the gun turret with a new turret fitted with a stereoscopic rangefinder for better long-range accuracy. Trials of the T5E2 at APG from April 1939 to February 1940 were successful and the design served as a forerunner for the later M3 medium tank.

While testing of the T5 Phase III took place, the first serial production of the M2 medium tank began at Rock Island Arsenal in the summer of 1939. A total of 18 were completed. Testing of the initial production vehicles prompted the army to prematurely end M2 production in favor of the upgraded M2A1 medium tank based on the T5 Phase III. The M2A1 introduced a new, more spacious turret, automotive improvements and thicker 1.25-inch (32mm) armor.

The stunning defeat of the French Army in June 1940 sent shock waves through the US Army. The central role played by the panzer divisions



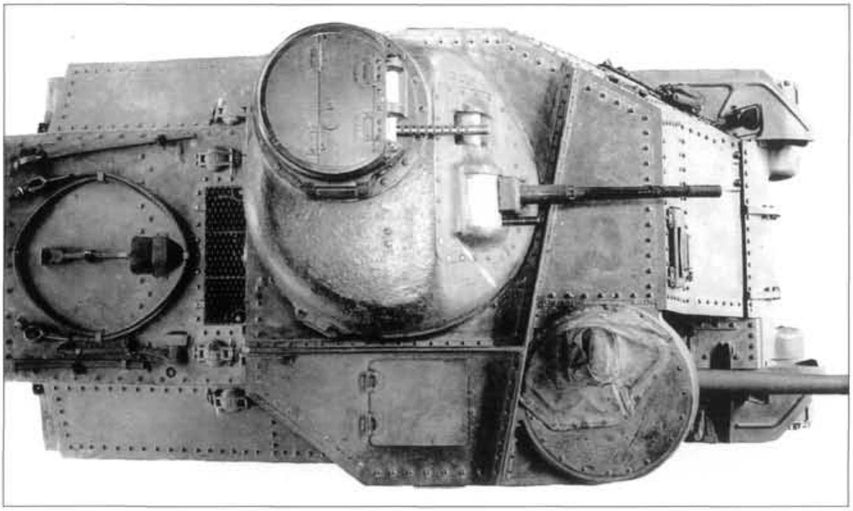
The T5E2 medium tank pioneered the configuration of the M3 with its sponson-mounted 75mm howitzer. It employed a small turret armed with a single machine gun and an optical rangefinder. (Patton Museum)

forced the US Army to begin a crash program to raise its own tank divisions, and a modern medium tank was clearly needed. In the summer of 1940, the army consolidated its scattered infantry tank units and cavalry mechanized units into the new Armored Force, and Congress provided funding for 1,500 medium tanks. Rock Island Arsenal did not have the capacity to build so many tanks, so the army turned to industry. The presumption was that locomotive plants would be best suited to manufacturing large armored vehicles such as medium tanks. In addition, the army decided to create a specialized tank plant near Detroit, and Chrysler was given the contract to manage this facility. Chrysler received a contract for 1,000 M2A1 tanks on August 15, 1940, to be delivered in a year's time. The ink on the contract was hardly dry before the army reconsidered its plans. The M2A1's appalling design was a sad reflection on the backward state of US tank design in general, and it was painfully evident to the US Army that the M2A1 was already obsolete. The 1940 France campaign made it clear that a medium tank needed at least a 75mm gun comparable to the French Char B1 bis or German PzKpfw IV. As a result, the Chrysler contract was modified on August 28; instead of 1,000 M2A1s, Chrysler would provide the same number of the new M3 medium tank armed with a 75mm gun. Production of the M2A1 returned to Rock Island Arsenal, and between December 1940 and August 1941, 92 of these dismal tanks were manufactured. Their combat potential was so questionable that in April 1942, Ordnance recommended that the 110 M2 and M2A1 medium tanks should be limited to training use. Thus they were never deployed in combat and were declared obsolete in October 1942.

BIRTH OF THE M3 MEDIUM TANK

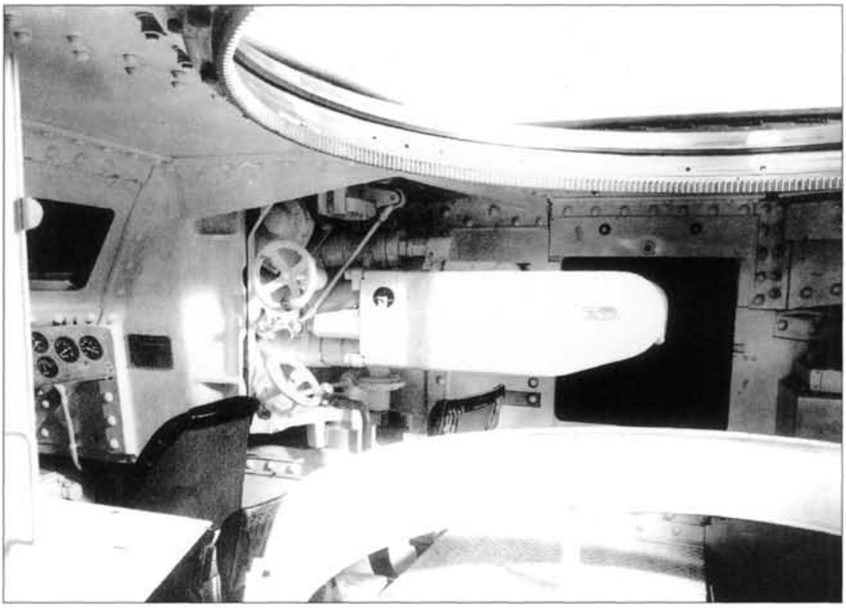
In June 1940, the chief of infantry recommended that, based on the recent campaign in France, US medium tanks should incorporate at least 2-inch (52mm) armor on the front. The characteristics for the new tank were drawn up in mid-June 1940 and standardized on July 11, 1940, as the M3 medium tank, even though the design was far from complete. In August 1940 the head of the new Armored Force, General Adna

A fine overhead shot shows the distinctive layout of the M3 medium tank with its right-side sponson gun, turret and turret machine-gun cupola. (NARA)



Chaffee, met with Ordnance officers to discuss the M3 medium tank requirements. On being presented with some sketches of an M2A1 derivative with a multitude of gun barbettes and a sponson gun, Chaffee made it clear that he wanted a tank with thicker frontal armor and a 75mm gun in a fully rotating turret. Ordnance officials warned Chaffee of their lack of experience in designing a turret, turret ring, and gun mounting sufficient for a 75mm gun, and, given the extreme urgency of the requirement, recommended an interim medium tank patterned on the T5E2 with a sponson-mounted 75mm gun supplemented with a turreted 37mm gun. The original design was modified by deleting the machine gun barbettes, but Ordnance remained infatuated with an excess of machine guns, including two fixed forward-firing machine guns and another in a cupola on top of the turret. Design of the M3 began in September 1940 and the first pilot was completed in March 1941. The Armored Force remained very unhappy with the M3 design and wanted its production run limited to about 360 tanks to cover the gap until the 75mm gun tank was ready. In the event, this limit was ignored because of the urgent need for medium tanks.

The urgency for rushing the M3 into production was increased by the arrival of a British purchasing commission in the United States in 1940. After heavy tank losses in France, the British Army wanted to purchase 3,650 cruiser tanks in the United States, preferably based on British designs. Neither the US government nor industry was interested in manufacturing British designs, and British tank officers were not keen on the M3 design after being shown early mockups. Part of the problem was that the US and British armies had fundamentally different views about the tactical role of armored divisions, with the US favoring the traditional cavalry mission of an exploitation force rampaging through the enemy's rear areas after the breakthrough had been accomplished by the infantry, while the British conception focused on the need to defeat the panzer divisions. The US doctrine implied a tank with a dual-purpose gun, with an accent on high-explosive firepower, while the British doctrine favored a cruiser tank with a gun oriented toward antitank firepower. With little bargaining power, the British purchasing team reached an agreement under which a variant of the M3 medium tank with



This interior view of an M3 without its turret shows the driver station to the left and the 75mm gun station in the center. (NARA)

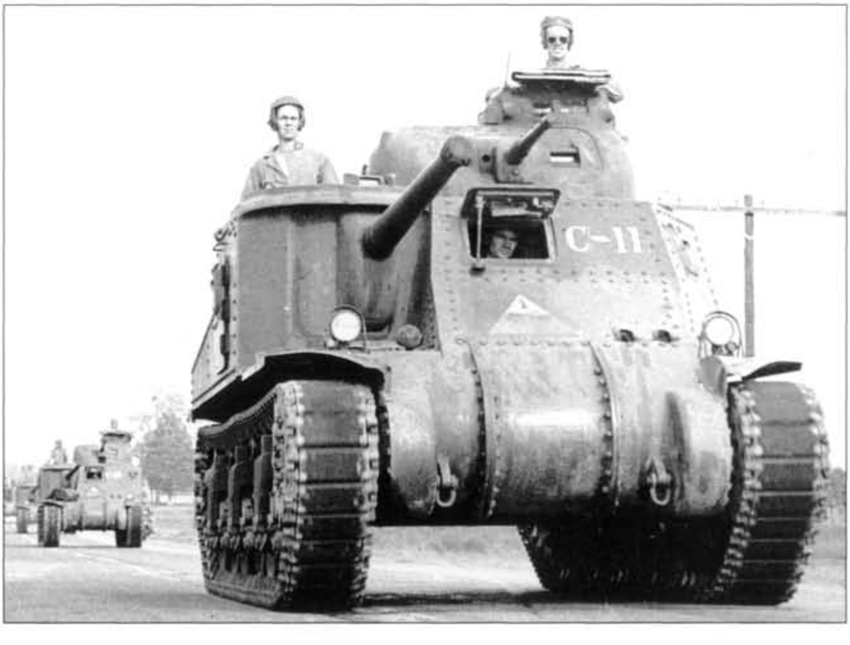
a different turret and other modifications would be built for the British Army. In particular, British doctrine favored placing the tank radio in the turret near the commander, which required a bustle on the tank turret that the American M3 design lacked. Initially, the British government contracted with four American railroad plants to manufacture a total of 2,085 M3 tanks and with the Montreal branch of the American Locomotive Company (ALCO) for a further 1,157 cruiser tanks based on the M3 chassis. The US government placed parallel contracts for 2,220 M3 medium tanks later in the year with the same plants. When the Lend-Lease Act was passed by Congress in March 1941, this provided a legal basis for US arms sales to Britain while retaining the pretense of neutrality, and the US government took over the British contracts for the M3 tanks.

Besides the existing contract with the new Detroit Tank Arsenal, additional contracts went to the American Locomotive Company (ALCO), Baldwin Locomotive Works, Lima Locomotive Company, Pullman Standard Manufacturing Company, and the Pressed Steel Car (PSC) Company. Ultimately, all Pullman and PSC M3 production went to Britain, along with some of the Baldwin production.

The design of the M3 medium tank was influenced by the T5E2 layout as well as foreign designs such as the French Char B1 bis. Instead of the short 75mm howitzer, the more potent M2 75mm gun was mounted in the right sponson. The M3 also had a turret-mounted gun, the same 37mm gun used in contemporary light tanks such as the M3 Stuart. Two turrets were designed, one at Rock Island Arsenal for the American M3 medium tanks, and one by a British team led by L.E. Carr with a turret radio bustle. The American turret had a fully traversable cupola above the turret armed with a .30-cal. machine gun, a feature deemed foolish by the British. The British turret was more spacious and had a simple hatch instead of a cupola. Detail design was finished in January 1941 and the first pilot was completed at Rock Island Arsenal on March 13, 1941. Production quickly followed at the plants, starting with the Detroit Tank Arsenal, which completed its first model in April 1941. Although the production tanks were supposed to be fitted with the newer and longer M6 37mm gun in the turret, shortages led to the use of the shorter M5 37mm gun in some tanks until the supply situation improved. The first of the M3 tanks with the British turret were completed in July 1941.

Owing to the rush to put the M3 into production, a string of improvements was needed. The M3 pilot tank was fitted with one-axis stabilizers for both the main M2 75mm gun and the 37mm M6 gun, but this was not fitted to the initial production tanks because of recurring problems. A barrel counterweight helped solve the balance problems: on the 75mm gun, this was fitted to the end of the barrel, while on the 37mm, it was fitted under the gun barrel on the mantlet. Serial production of tanks fitted with the stabilizer and associated counterweights began in November 1941 at the Detroit Tank Arsenal, and followed at the other plants in January 1942. Both the British Army and the US Armored Force desired a gun with better antiarmor performance, and a lengthened version of the M2 75mm gun was developed in 1941, the M3. It was adopted as standard in May 1941, and once it entered production, there was no longer a need for the counterweight. A final improvement on the main gun resulted in the use of an M15 telescopic sight with an aperture through the gun mantlet, rather than the complicated and often misaligned periscopic sight used on the earlier production tanks.

The British variant of the M3 medium tank, called the General Grant I in Britain, was manufactured by Baldwin, Pressed Steel Car Company, and Pullman Standard Car Company. Besides the different turret, there were other small differences such as a periscope for the driver. Improvements were gradually made to the Grant during production, including the addition of full sand-skirts over the suspension and the new WE-210 rubber-block track. Production of the custom-built Grant I tank could not meet the British need for tanks caused by high casualty rates in

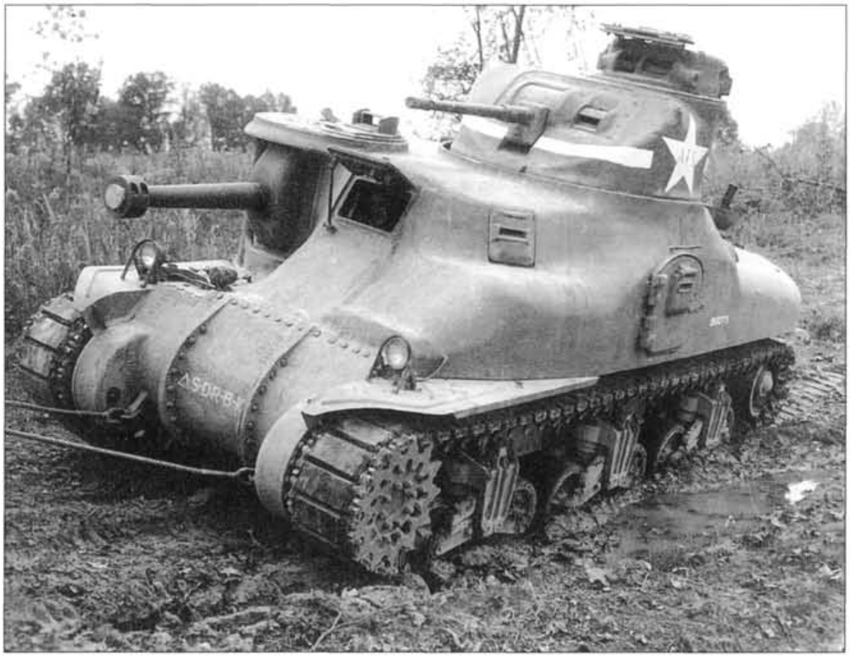


A column of M3 medium tanks of Co. C, 1/69th Armored Regiment, 1st Armored Division, taking part in the Carolina maneuvers in November 1941. These are from the initial production series lacking the gyrostabilizers for the gun, as is evident from the lack of gun counterweights. (MHI)

the desert campaign, so Britain also acquired the American version of the M3 medium tank, which was known locally as the General Lee I.

Plans were under way in 1941 to extend M3 production to an ALCO subsidiary in Canada, the Montreal Locomotive Works. However, British and Canadian officers were not pleased with the awkward M3 configuration and opted instead for a cruiser tank better suited to British doctrine. Since the Montreal plant was already producing components for the M3, the suspension and powerplant of the M3 formed the basis for the "Modified M3 Cruiser Tank," which was subsequently named "the Ram." The M3A6 designation was reserved for a Ram variant with a riveted hull that never materialized. The Ram cruiser tank, like the forthcoming M4 medium tank, had its main armament in a cast turret. Instead of the dual-purpose 75mm gun of the M4 medium tank, the Ram was to be armed with the British 6-pdr (57mm). The first batch of 50 Ram Mk. I tanks began production in December 1941. These had only a 2-pdr gun because of delays in receiving the intended guns, but the definitive Ram Mk. II with the 6-pdr (57mm) gun entered production in January 1942 shortly before M4A1 production in the US. Ultimately, the Ram never saw combat in its battle-tank version. By the time that the Ram was available, the British Army had changed its opinion on tank guns after having used the Grant in combat in the desert, and now appreciated that the 75mm dual-purpose gun was a more versatile weapon than the 6-pdr, especially for dealing with enemy antitank guns. In reality, the Ram was an M3 derivative, but the US Army subsequently designated it as the M4A5 medium tank, as it was produced in Canada in parallel with the M4 Sherman series.

Total production of the basic M3 medium tank and British Grant I tank amounted to 4,924 tanks or about 79 percent of eventual M3 series production. This was a substantial industrial accomplishment considering the past US record in tank production.

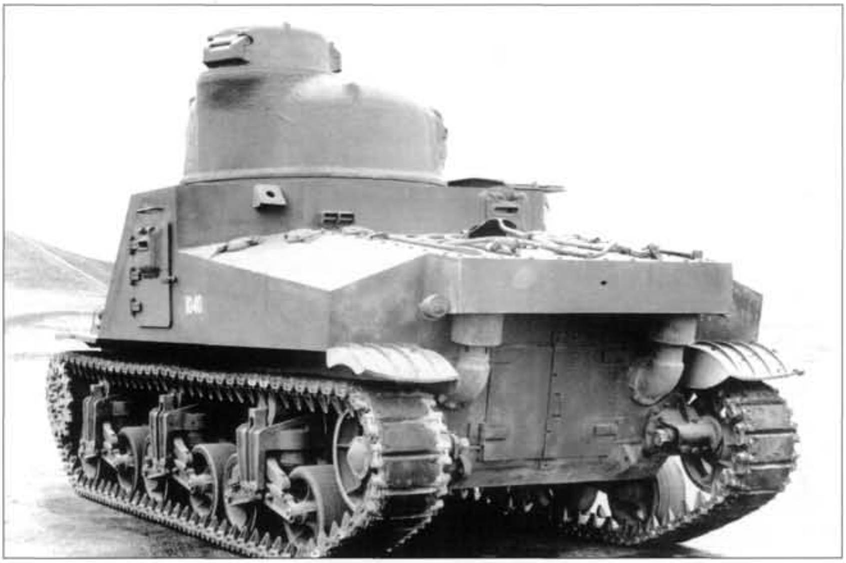


The M3A1 medium tank differed from the other variants in using a cast hull. This is an intermediate production example with the splash strip at the base of the turret and the stabilized 75mm gun, and is seen serving in one of the driver companies of the Armored Force School at Ft Knox in 1942. (NARA)

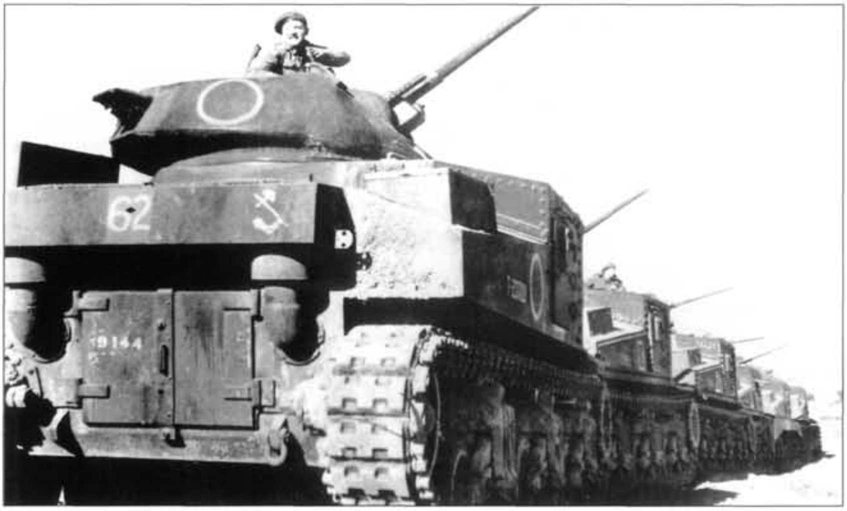
M3 TANK VARIANTS

As more American plants became involved in tank production, the US Army tried to simplify manufacture. One alternative was to employ a single casting for the hull superstructure instead of the complicated riveted design. This version was designated as the M3A1 in October 1941 and a total of 300 were manufactured by ALCO starting in February 1942. In spite of the short production run, there were numerous changes to the cast-hull M3A1 design, including an added protective lip around the turret race on the intermediate production vehicles, and the revision of the upper roof hatch on the final production series with the hinges at the base of the door, not the top. The M3A1 also underwent other changes occurring more broadly in M3 production, including the removal of the hull side doors and the addition of more armored ventilation covers to the roof of the superstructure and turret in the final production batches. A total of 28 of these were completed with the Guiberson T-14090-2 diesel engine instead of the usual Continental radial engine, but the diesel program was cut short because of the unreliability of the engine.

Another alternative in hull construction was the use of welded-plate construction instead of riveted construction, prompted in part by the threat of rivets flying into the crew compartment if the exterior of the rivet was hit by small-arms fire. The short-term solution to this problem was to seal-weld the rivet heads, which was ordered in March 1942. The Carnegie-Illinois Steel Corporation built a welded M3 hull for Rock Island Arsenal in May 1941 and tests concluded that it was superior to the riveted construction. The first of the welded-hull versions was the M3A2, which was otherwise identical to the basic M3 medium tank. Production of the M3A2 began at Baldwin in January 1942, but was suspended in March when it was decided to switch to the diesel-powered, welded-hull M3A3. The decision to move to the diesel engine was due to the bottlenecks in engine supplies, since the Continental radial engine used in the M3, M3A1, and M3A2 was also used in aircraft manufacture.



The rare welded-hull M3A2 can be mistaken for the welded-hull M3A3 except in rear views like this that show the characteristic rear-engine arrangement of the Continental radial engine tanks. This shows the early configuration with the cylindrical air filters. (NARA)



Rarest of the rare: a Grant III in service with C Squadron, 2/9th Armoured Regiment, Australian 1st Armoured Division. Only a dozen M3A2 chassis were built, and this is one of the few examples with the Grant turret. (NARA)

The engine selected for the M3A3 was the General Motors Model 6046, which combined two 6-71 diesel bus engines. The hull rear was reconfigured to accommodate the air intake and exhaust systems. When mounted in a welded hull, the tank was designated as the M3A3, while those manufactured with a riveted hull were designated as the M3A5. Production was undertaken at Baldwin in January–December 1942, with a total of 322 M3A3 and 591 M3A5 tanks being manufactured.

The third engine option for the M3 was the new Chrysler A57 multi-bank engine, which was created by combining five bus engines at the base to create a star-shaped engine offering 425 horsepower. Although complex, the A57 used available machine tools, so it could be put into production rapidly. This required a lengthened hull, and production of the M3A4 was undertaken from June 1942 to August 1942 at the Detroit Tank Plant with some 109 tanks completed. There were some later efforts to improve the M3 power train, such as the experimental M3E1 and M3A1E1 with the Ford V-8 engine and the M3A5E1 and -E2 with new transmission. However, with M4 medium tank production underway and M3 production concluding, these did not reach production.

The British Grant turret was fitted to most hull types, including the M3, M3A2, M3A3, and M3A5. It does not appear to have been fitted to either the M3A1 or M3A4 hulls, even though the British allotted designations to such variants. In total, about 1,660 tanks were completed with the Grant turret, or a bit more than a quarter of the total production.

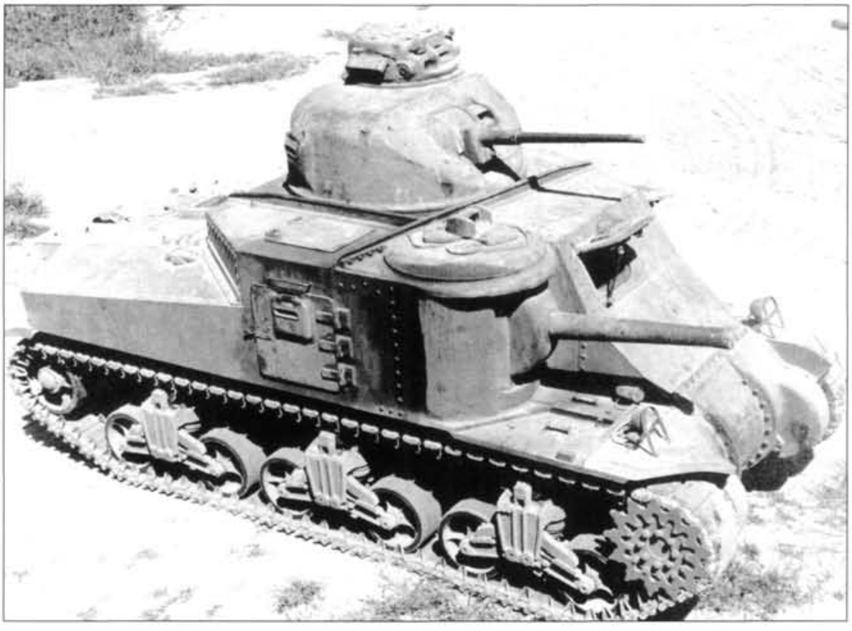
BRITISH M3 CRUISER TANK DESIGNATIONS

British Turret	US Turret	US Designation	Engine type
Grant I	Lee I	M3	gasoline
Grant II	Lee II	M3A1	gasoline
Grant III	Lee III	M3A2	gasoline
Grant IV	Lee IV	M3	diesel
Grant V	Lee V	M3A1	diesel
Grant VI	Lee VI	M3A2	diesel
Grant VII	Lee VII	M3A3	diesel
Grant VIII	Lee VIII	M3A4	gasoline
Grant IX	Lee IX	M3A5	diesel

During the course of production, a variety of incremental improvements were undertaken across the entire M3 family. British reports indicated that the side doors were susceptible to spall damage, so an escape hatch was added to the belly and the hull doors welded shut. In the final production runs, the hull doors were completely absent.

Tests also showed that there was an excessive build-up of fumes inside the turret and hull when the guns were repeatedly fired, so more ventilator fans were added on the hull and turret roof. Starting in January 1942, Ordnance began to make improvements on the M3 and M4 medium tanks in parallel, since they both shared so many common components. This first affected new tracks, which were interchangeable between the two types. One of the final production changes on the M3 medium tank was the introduction of a new reinforced suspension bogie with more robust volute springs and a trailing return roller mounted behind the bogie to accommodate the springs. By the time that this new bogie was ready in mid-1942, production of the M4A1 medium tank had already begun, so this feature was introduced in parallel on the M3 and M4A1 medium tank production lines.

Production of the M4A1 medium tank started in February 1942 at the Lima Tank Plant and gradually expanded to the other tank plants throughout 1942. Since this was a far more satisfactory design than the M3 medium tank, production of the M3 gradually trailed off in the latter half of 1942, finally ending in December as available sub-assemblies were used up. The M4 medium tank was essentially the same as the M3 medium tank in its hull, suspension, and powertrain. Indeed, the M4 series was based on the same powerplant solutions first developed for the M3, with the M4 and M4A1 having the same Continental radial and welded/cast configuration as the M3/M3A1, the M4A2 corresponding to the M3A3/-A5 diesel and the M4A4 corresponding to the M3A4 with its Chrysler multi-bank engine. The only new family in the M4 series was the M4A3 with the Ford V-8 engine, first tested in the M3E1. With the M4



The M3A3 was configured with a welded hull and powered by the GM 6046 diesel, as is evident from a close inspection of the engine deck in this example. (Patton Museum)

tanks arriving in growing numbers, the M3 medium tanks were declared limited standard in April 1943.

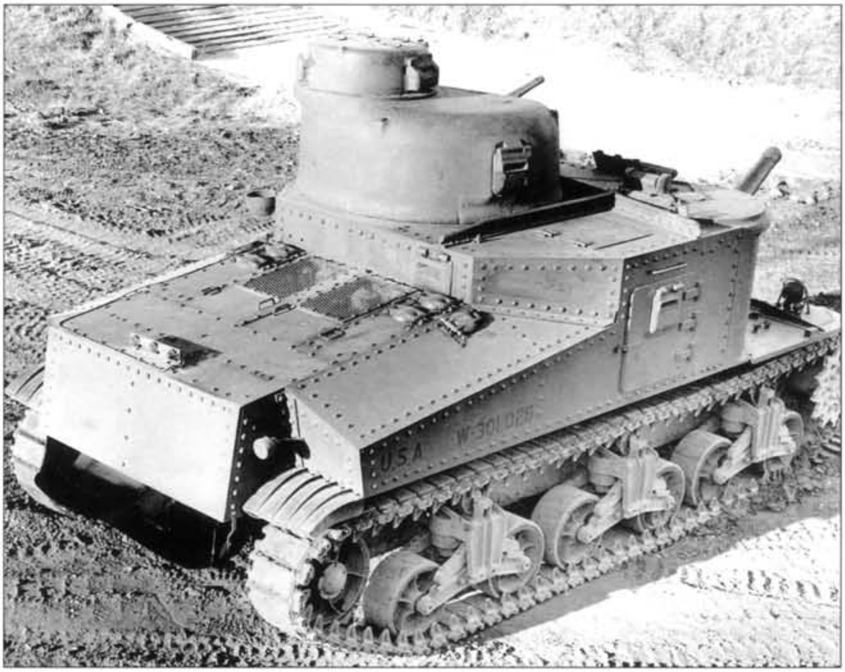
M3 MEDIUM TANK PRODUCTION

Type	M3	M3	M3	M3	M3	M3A1	M3A2	M3A3	M3A4	M3A5	Sub-total
Plant	ALCO	Baldwin	Detroit	PSC	Pullman	ALCO	Baldwin	Baldwin	Detroit	Baldwin	
1941											
Jun	8	2									10
Jul	17	2	7								26
Aug	8	12	50	1	9						80
Sep	45	8	95	18	27						193
Oct	37	24	148	21	19						249
Nov	26	38	194	22	29						309
Dec	83	78	235	42	37						475
1942											
Jan	47	65	300	60	61		4			1	538
Feb	4	56	300	76	74	7	5			5	527
Mar	30	10	366	71	63	66	3	1		12	622
Apr	20		381	49	71	66		4		97	688
May	28		400	40	48	62		18		106	702
Jun	7		424	67	47	51		46	33	97	772
Jul	4		317	34	15	17		35	73	115	610
Aug	21		26			31		91	3	62	234
Sep								30		28	58
Oct								46		28	74
Nov								41		39	80
Dec								10		1	11
Total	**385**	**295**	**3,243**	**501**	**500**	**300**	**12**	**322**	**109**	**591**	**6,258**

COMBAT DEBUT: BRITISH EIGHTH ARMY

The Grant tank saw its combat debut in the cruiser-tank role with British armored units in the desert campaign in the spring of 1942. Unlike the US Army, with its light and medium tanks, the British Army categorized tanks by two principal roles: the cruiser tanks in the armored divisions and brigades oriented toward defeating panzers, and infantry tanks oriented toward close support of the infantry. The first Grant tanks arrived in the Middle East in November 1941 and were first used for trials and training. Shipments were slow to arrive, and the first unit equipped, the 5th Royal Tank Regiment (RTR), had only 32 at the beginning of February 1942. The Grants were a welcome addition to the British arsenal after the serious losses endured during Operation *Crusader* in November 1941, and continuing problems with British tank designs. British armored division doctrine focused on the defeat of German panzer divisions, and, as a result, British cruiser tanks were armed first with the 2-pdr and later the 6-pdr guns. Both of these had excellent antiarmor performance, but did not offer a high-explosive punch. This became a serious drawback in the desert war, where the German Afrika Korps used combined-arms tactics to circumvent their own weakness in panzers. Rommel was often able to overcome larger

The M3A5 used a riveted hull and was powered by the GM 6046 diesel, as is evident from the engine deck. This is the 28th production tank on trials at APG on November 26, 1941. (NARA)



British tank forces with numerically inferior panzer units by skillfully employing antitank guns with the panzer force. These guns, such as the PaK 38 50mm antitank gun, were small targets and nearly impossible to knock out by tank guns firing armor-piercing shot. Likewise, the 88mm flak gun, used in an improvised antitank role, had greater range than British tank guns and so could stand off at a distance and still wreak havoc with the British tank forces. The Grant offered an antidote to the antitank gun threat, since it could fire an effective high-explosive projectile that had a much greater chance of disabling an antitank gun even without a direct hit. The Grant's 75mm gun was also effective in the antitank role, and was supplemented by the 37mm gun in the turret, which offered performance similar to the British 2-pdr tank gun. A gunnery instructor with the 3rd RTR recalled that "the crews were overjoyed to be able to fire a large 14 pound shell at the Panzer tanks."

The Grant's other significant advantage was its automotive reliability. At the time, British tank regiments in the desert were receiving the new Crusader cruiser tank, which suffered from engine reliability problems that resulted in serious mechanical attrition in combat until technical improvements were made. Overall, the Grant was well received. A tank officer recalled "it was fairly fast with a possible road speed of about 25mph, well-armoured, and considered capable of out-shooting an enemy tank or antitank gun except the 88mm. The Grant crews also found their new tank and armament ideal and we looked forward to meeting the panzers more or less on even terms."[1]

The Grant had its share of problems, however. The configuration of the sponson-mounted gun was far from ideal because it offered only limited traverse. The dual 37mm/75mm armament was a distraction to the commander because it was difficult to concentrate on more than one

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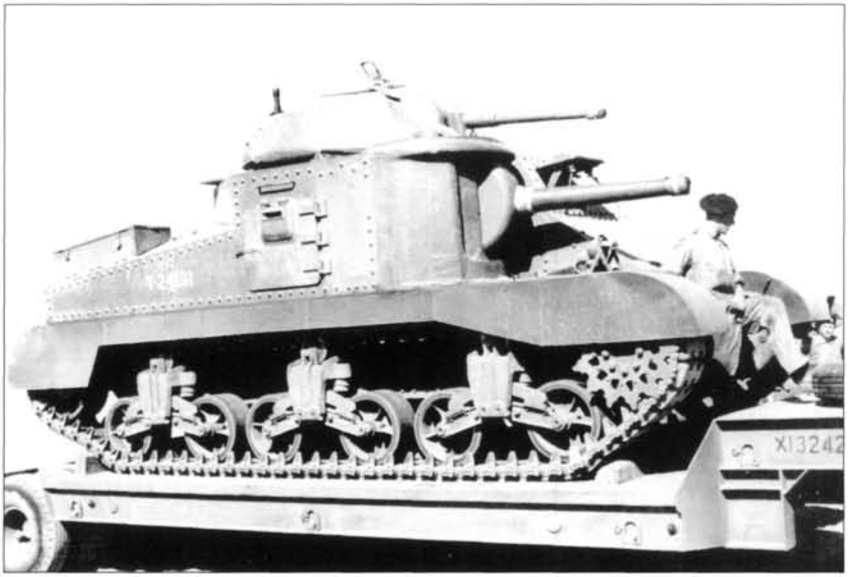
[1] Major Bill Close, *A View from the Turret: A History of the 3rd RTR in the Second World War* (Dale & Bredon, 1998).

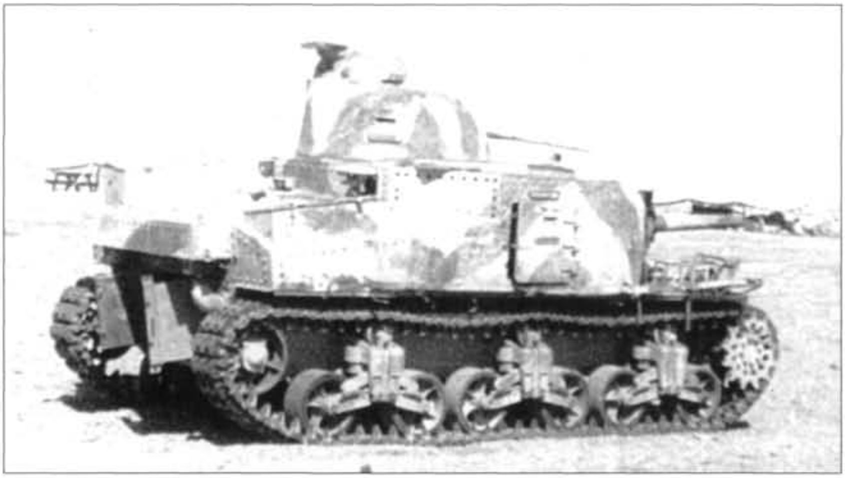


A Grant tank in its original olive drab finish arrives in Egypt on a tank transporter in the spring of 1942. (MHI)

target at a time. The silhouette of the tank was high, which was both a blessing and a curse. In some conditions it offered the commander a better vantage point for spotting enemy targets in the flat desert wastes. But as often as not, it simply presented a larger target to the enemy. The location of the 75mm gun made it difficult to take advantage of hull-down positions, using terrain to protect the bulk of the tank.

By March 1942, there were about 340 Grants and Lees in Egypt along with American liaison teams to provide training and maintenance assistance. British units seldom distinguished the Grant and Lee, generally labeling both types as "Grants" regardless of the turrets. Although the majority of the M3 medium tanks arriving in the desert were the radial-engine M3, some diesel-engine M3A5s (Grant IX) were also deployed. Efforts were made to better adapt the tanks to desert conditions. Sand shields were fitted to tanks at workshops in Egypt, starting in January 1942, and the US plants began adding these in the factory. Other changes were authorized in January 1942, including improved exterior stowage and a cloth mantlet cover for the 75mm gun to reduce the intrusion of sand. Later in the month, workshops began plugging up the fixed-hull machine-gun ports, as this armament was judged to be useless, and the 75mm ammunition stowage was raised to 80 rounds and put in armored bins. In February 1942, there were a number of modifications made to the suspension to improve its durability. Some units made their own local improvements, such as sun-hoods to shade the periscopes, markings on the 75mm elevator wheel to improve their use at longer ranges, improvements to stowage, and various types of blade sights to permit the commander to rapidly slew the guns toward the target.

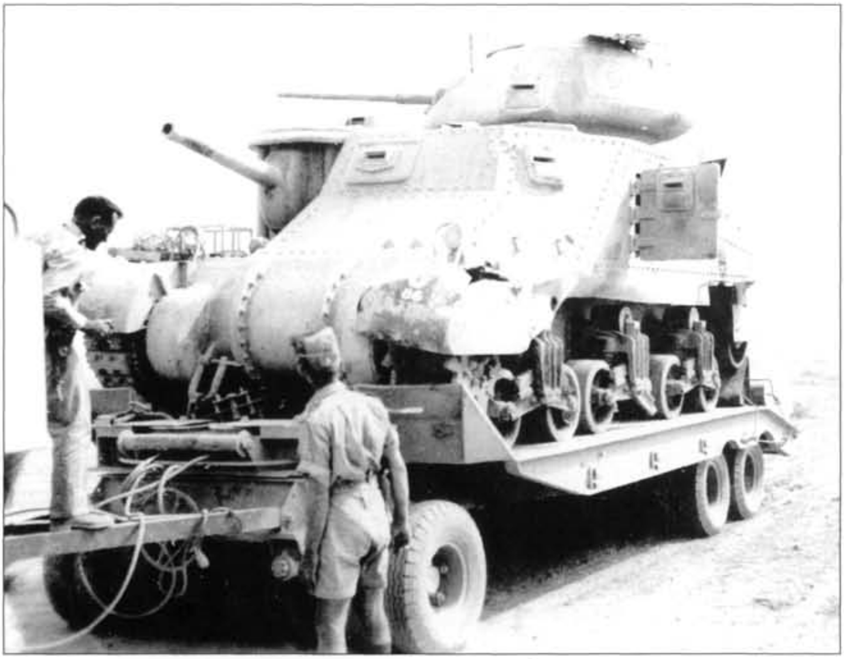
At the time of the Gazala battles in May 1942, British units had 167 Grants and Lees with the 1st and 7th Armoured Divisions, with more in Egypt equipping other units or being used for training or reserve. This made it the second most common tank type in the armored divisions: there were 257 Crusaders and 149 Stuarts. At the time, the Grant represented one of the best tanks in the desert, offering better antitank punch than the 50mm gun on the PzKpfw III and better armor protection.



A Lee tank at the ordnance school near Cairo in the spring of 1942 in an improvised desert camouflage scheme. (MHI)

Generally, the Grants and Lees were not deployed in homogenous formations but with either Crusader or Stuart squadrons. In the 1st Armoured Division and the 9th and 22nd Armoured Brigades, the regiments typically had 36 Crusaders and 12 Grants, while in the 7th and 10th Armoured Divisions and the 1st Armoured Brigade, the regimental mix was typically 24 Grants and 20 Stuarts.

In spite of the new Grant tanks, the May–June Gazala battles went badly for the Eighth Army. The problems were not technical, but tactical. The Afrika Korps continued to display greater combat effectiveness, principally better combined-arms tactics, in spite of technical and numerical shortcomings. Rommel's offensive succeeded in pushing the Eighth Army back into Egypt to El Alamein. The performance of the Grant during the battle was good, and its 75mm gun proved an unpleasant surprise for the Germans in numerous encounters. A staff officer who inspected the

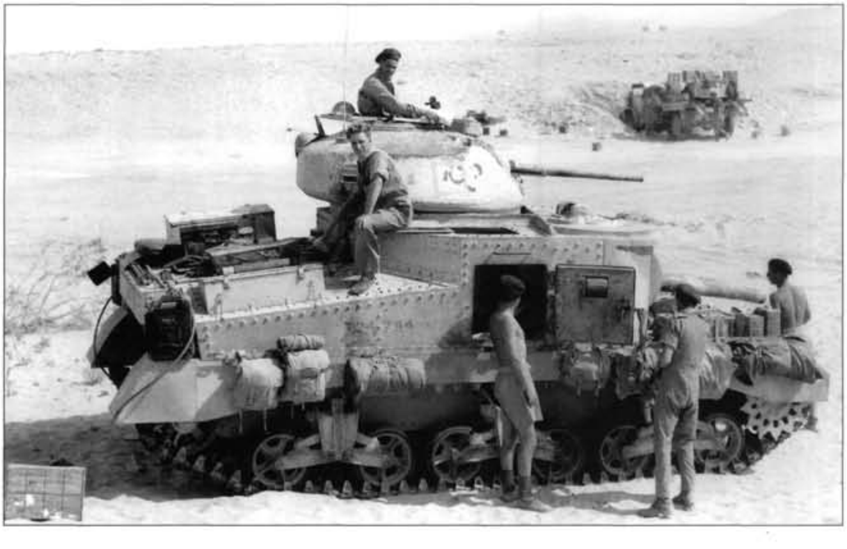


A tank transporter recovers Grant tank number 9 of C Squadron, 3rd RTR, 7th Armoured Division, following the Gazala battles in May 1942. Judging from the damaged sand-shield and lost track, it may have been victim of a mine. (MHI)

several knocked-out tanks from the 22nd Armoured Brigade afterwards commented that "it is apparent that the Grant tank can take a great deal of punishment." One Grant had been hit no fewer than 31 times, with the only damage being caused by two 50mm hits on the front visors and a rear hit by a 37mm gun. Another had been hit 12 times with no penetrations. Larger-caliber artillery was particularly lethal, with two of the inspected tanks penetrated and burnt out by 105mm howitzer hits and another by an 88mm round that set off an internal fire.

Tank losses at Gazala were heavy on both sides, and July was spent rebuilding for the next encounter. The August fighting at Alam Halfa again saw the Grant as one of the mainstays of the British armored force, with 164 Grants and Lees among the 713 tanks in the forward-deployed units. The battle was fought from defensive positions, and the Grants were often emplaced with the help of engineers and bulldozers to reduce their high silhouette. On the German side, the Alam Halfa battle represented the arrival of the long-barreled 75mm gun on the PzKpfw IV Ausf. F2 tank, an echo of the arms race taking place on the Russian Front since 1941. Of the British casualties of the battle, 31 of 67 were Grants, but 13 were repairable. Alam Halfa was the last of Rommel's offensives against the Eighth Army. With British command rejuvenated by the arrival of a dynamic new leader, Lieutenant General Bernard Montgomery, the initiative shifted to the British side, with preparations for an offensive at El Alamein.

The second battle of El Alamein started on October 23, 1943. Montgomery began methodical preparations for the offensive in the late summer, and Churchill pressured the US government to speed the shipment of new tanks, especially the new M4A1 Sherman. At the time of the battles, Lend-Lease tanks made up the backbone of the British armored forces, with 270 Shermans and 210 Grants. Britain received priority for the new M4 tanks and the US 1st Armored Division remained saddled with the older M3 medium tank. The Grant was still a viable battle tank in the autumn 1942 fighting, since the Afrika Korps still had few of the long-barreled PzKpfw III Ausf. L or PzKpfw IV Ausf. G. Losses through November 10 included 53 Grants, of which 30 were complete



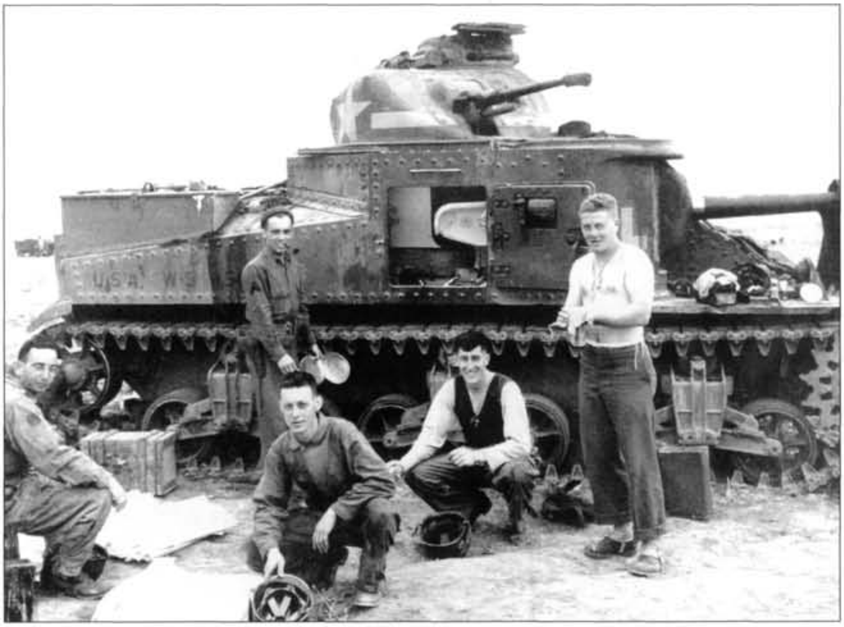
A fine study of a Grant shortly after being issued to the Royal Scots Greys following its deployment in Egypt in September 1942 after service as a cavalry regiment in the Syrian fighting. (Australian War Memorial Photo 025033)

write-offs. In total, 350 Grants and Lees were lost in combat in 1942. El Alamein was the high point of the Grant's career in the desert war, but gradually the Sherman became the preferred replacement. It had all of the advantages of the Grant, including its 75mm gun and its automotive dependability, and none of its vices, such as the awkward gun configuration or excessive silhouette. The Grant remained in service as a battle tank through to the end of the Tunisia campaign in May 1943, but in dwindling numbers.

COMBAT DEBUT: US 1ST ARMORED DIVISION

The M3 medium tank was ready for deployment to US Army units in the summer of 1941, and first went to the 1st Armored Division. They took part in the Louisiana maneuvers in August 1941, and later with the 2nd Armored Division during the Carolina maneuvers in November 1941. Attitudes toward the new tank varied. The new head of the Armored Force, Major General Jacob Devers, was highly critical of the design, strongly favoring a more conventional design with the main gun in the turret. Units of the 1st Armored Division were delighted to receive the new tanks, as they had been equipped with M3 light tanks armed only with the 37mm "squirrel rifle." Nevertheless, some tankers recognized its odd configuration and one complained that it looked like "a damned cathedral coming down the road."

The first large-scale use of US tanks after the disastrous Philippines campaign took place with the Operation *Torch* landings in November 1942 along the French North African coast. Elements of the 1st and 2nd Armored Divisions landed, but only the Combat Command B (CCB) of the 1st Armored Division saw extensive combat in the November–



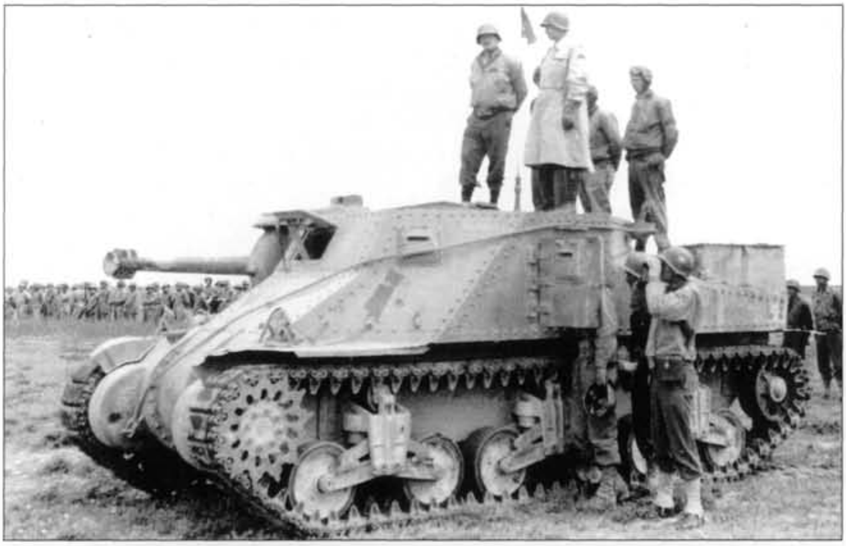
An M3 medium tank and its crew of Co. F, 2/13th Armored Regiment, near Souk al Arba in Tunisia on November 23, 1943. This is an intermediate production tank with the gyrostabilizers and gun counterweights. (NARA)

December 1942 fighting. At the time, the 1st Armored Division had three of its medium tank battalions equipped with the M3 and a single battalion with the new M4 and M4A1 medium tanks. The medium tanks did not take part in the initial combat actions with Vichy French forces immediately after the landings, as there was no convenient way to disembark medium tanks at the time. As a result, the medium tank battalion in CCB, the 2/13th Armored, did not see extensive combat until the 1st Armored Division was deployed to Tunisia late in November 1942 as part of the race for Tunis. The first major contact with German forces took place on November 26 when 1/1st Armored Regiment (M3 light tanks) fought a skirmish with a company from Pz.Abt. 190 on the road to Mateur.

The first major engagement involving the M3 medium tanks was on the afternoon of November 28, 1942, when the 2/13th Armored Regiment supported the 5th Northamptonshire Regiment in an attack on Djedeida. The British infantry rode on the tanks until contact was made with the Germans, but the attack on the village was beaten off by antitank gun fire. Most of the fighting in early December was a frustrating series of small skirmishes, with most tank losses caused by camouflaged antitank guns. The heaviest losses were suffered on December 6 when 2/13th Armored, reinforced by a platoon of M4 medium tanks from the 6th Armored, 2nd Armored Division, took heavy losses from German antitank guns near Terbourba. The December fighting had been extremely costly to the CCB, who lost 84 of the M3 light tanks of the two light tank battalions and 40 of the M3 medium tanks of the 2/13th Armored. Some of the missing M3 medium tanks were replaced by stripping M4A1 tanks from the 67th Armored, 2nd Armored Division, and they were concentrated into one company of the battalion. The deputy commander of the CCB ruefully noted that "Our M3 medium tanks were no match for the German Mark IV, and our M3 light tanks were obsolete." When a delegation from the Armored Force headed by Major General Jacob Devers arrived for an inspection, they were amazed that the CCB was still not equipped with the current armor-piercing ammunition and had been using obsolete ammunition usually reserved for training in the United States. The poor performance of the tanks in the December fighting was partly due to this oversight, but the blame falls more heavily on the inexperience of the

An M3 of Gardiner's 2/13th Armored Regiment in action on February 20, 1943, after the costly fighting near Sbeitla. (NARA)

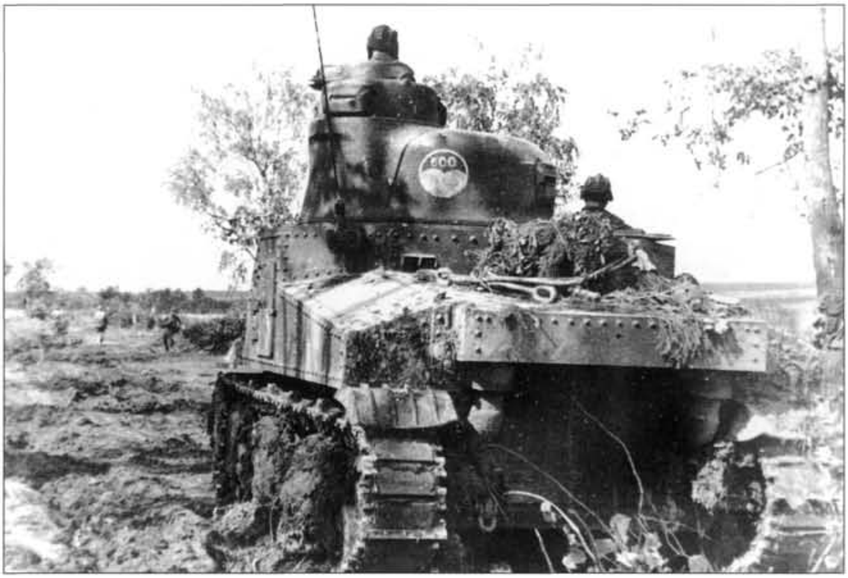
As the M4 and M4A1 replaced the M3 in Tunisia in early 1943, some tanks were adapted to other roles. This tank, "Alamo," was formerly used by the headquarters of the 3/13th Armored, and then converted to a turretless command tank for the regimental headquarters. (Patton Museum)



US units and the poor coordination of infantry and armor in many of the operations.

The remainder of the 1st Armored Division was re-equipped with the new M4 and M4A1 medium tanks while in the UK, so that by the time they arrived in Tunisia in December 1942, all the medium tank battalions apart from the decimated 2/13th Armored had Sherman tanks. Nevertheless, when the CCB commander was given the option of detaching the battered but battle-hardened 2/13th Armored or the inexperienced but well-equipped 2/1st Armored with M4 tanks, he wisely chose to stick with the M3 battalion. During the CCB's successful advance on the Ousseltia valley in January 1943, the 2/13th Armored proved to be an effective combat unit even though understrength with only 30 tanks. This battalion escaped the debacle near Sidi-bou-Zid on February 14–15, when two Sherman battalions, the 2nd and 3rd/1st Armored Regiments, were wiped out while attempting to rebuff elements of the 10. and 21. Panzer Division that were spearheading Operation *Frühlingswind*, the German offensive toward Kasserine Pass. The CCB's turn to face the German offensive came on February 17, 1943, near Sbeitla, but by this time Lieutenant Colonel Henry Gardiner's 2/13th Armored understood the German tactics. Its mixed force of M3 and M4 medium tanks remained concealed in hull-down positions until the attacking force from 21. Panzer Division had closed to short range. Gardiner radioed his tanks, "Boys, let them have it," and the sudden volley of 37mm and 75mm fire knocked out or disabled about 15 German panzers and temporarily blunted the attack. Although CCB was eventually forced to give up Sbeitla, Rommel later noted that the US forces there had fought "cleverly and hard." The 2/13th Armored covered the American withdrawal through Kasserine Pass, and after Gardiner's tank was knocked out in the fighting, he escaped on foot, walking back about 30 miles. He was later decorated with the Distinguished Service Cross for his actions that day. The CCB had lost about 10 tanks in the fighting around Sbeitla, and was later re-supplied with M4 and M4A1 tanks.

During the final campaigns in Tunisia, the 1st Armored Division had about three companies of M3 medium tanks on hand with only a few survivors in the 2/13th Armored. Although the 1st Armored Regiment



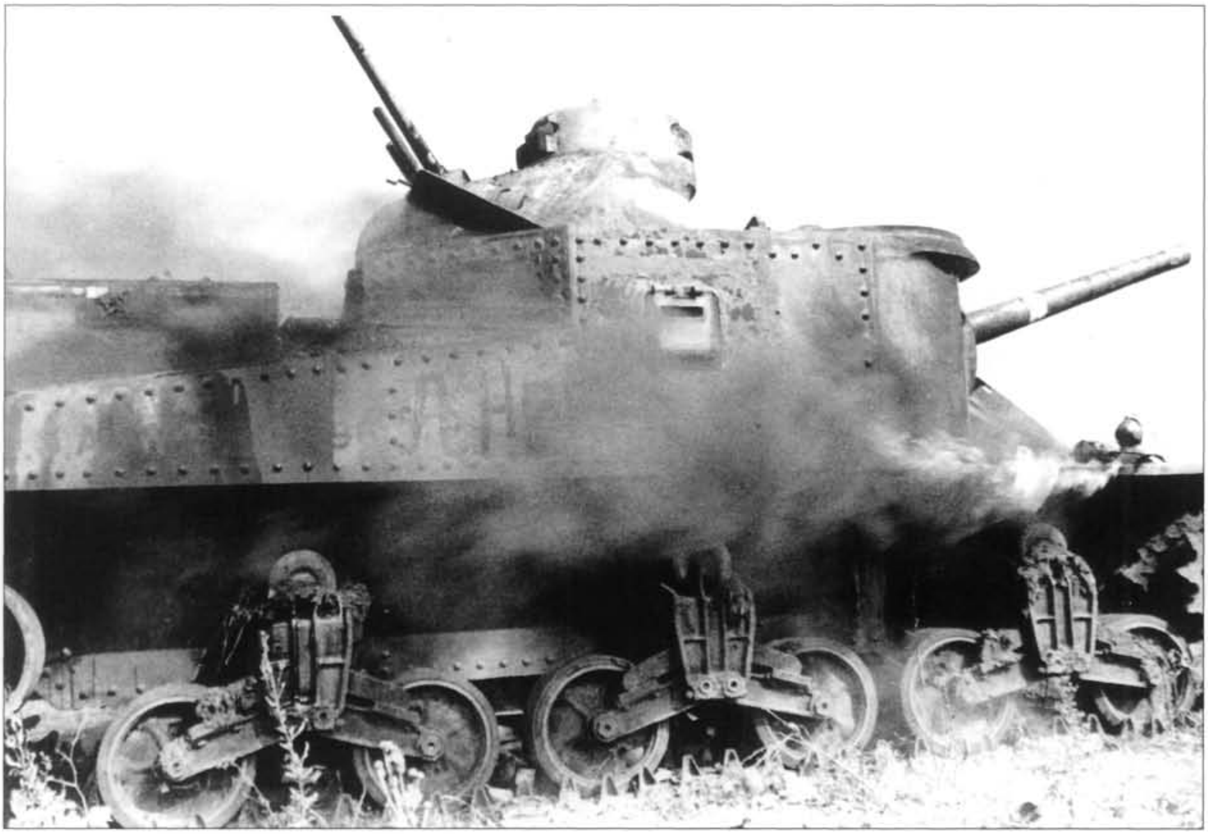
An M3 medium tank in use by the Red Army in the summer of 1942. Note that the track is fitted with grousers for better traction in the mud.

was supposed to be completely re-equipped with the M4 and M4A1 medium tanks in March 1943, shortages led to the use of available stocks of M3 medium tanks instead. As a result, the M3 medium tanks were still in use during the final fighting for Bizerte. By the end of the Tunisia campaign, the division had only 51 M3 medium tanks and 178 M4 and M4A1 tanks on hand, and all the M3 medium tanks were left behind at Oran for use by Free French forces for training purposes. Some five separate medium tank battalions arrived in North Africa in 1943, and three of these had M3 medium tanks when they arrived. Only one, the 751st Tank Battalion, saw any combat with the M3 medium tank when it was deployed to support the 34th Division in March 1943 during the advance on Bizerte. The Tunisia campaign was the first and last use of the M3 medium tank in combat by the US Army in the European and Mediterranean theaters.

COMBAT RECORD: RUSSIAN FRONT

Although not well known, some of the earliest combat use of the M3 medium tank occurred on the Russian Front. The first unit known to have been seen combat with the M3 medium tank was the 114th Tank Brigade on the Southern Front, which in May 1942 had two M3 medium tanks, two Matilda Mk. II tanks and 21 T-60 light tanks. Russian accounts frequently refer to the M3 as the M3S, the "S" indicating *sredniy* or medium. This was used to distinguish it from the M3 (or M3L) light tanks due to the confusing US Army nomenclature system. The M3 medium tanks were used on nearly all fronts in the 1942 fighting, especially in the summer and autumn of 1942. They were most commonly used in the separate tank battalions and brigades used to provide close support to the infantry.

Recent Russian accounts claim that some M2 or M2A1 medium tanks were supplied to the Red Army via Lend-Lease in 1942. No photographic evidence of this has appeared, and these claims appear to be based on a misunderstanding in records between M2 and Matilda tanks, which were



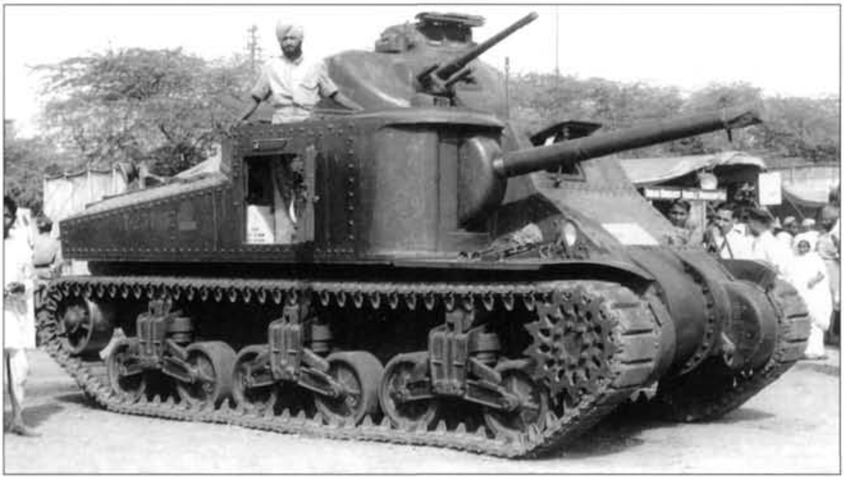
An M3 of the Red Army named after Prince Aleksandr Nevskiy burns during the summer 1943 fighting. This is a later production tank, lacking the side access doors. (NARA)

frequently listed as Mk. II in Soviet accounts. US inventory records from 1942 indicate that all M2 and M2A1 medium tanks manufactured were still in US service throughout 1942.

Russian accounts from the Soviet era derided the M3 as a "grave for seven brothers." This was typical Cold War rhetoric: the M3 medium was certainly better than many of the Soviet tanks used in the infantry support role, such as the T-60 and T-70 light tanks. While not as effective as the T-34 in the tank-fighting role, the M3 was still a useful weapon for infantry support. At the time of the Kursk battles in the summer of 1943, the 48th Army on the Central Front had 85 M3 tanks in two separate tank regiments (OTP): the 45th OTP (8 M3L, 8 SU-76, 30 M3S), and the 193rd OTP (3 Su-76 and 55 M3S). Russian records indicate that at least one M3 medium tank was still in service on the Baikal Front at the time of the war with Japan in August 1945.

BRITISH M3 MEDIUM CRUISER TANK DEPLOYMENT

	June 30, 1942	April 1943
UK	67	216
Middle East	990	732
Australia	104	777
India	212	896
Burma	114	
Iraq	57	
Total	**1,544**	**2,621**



A new Lee tank on display in India in 1942. The Lee was used to equip a number of Indian armored units and later served in the campaign in Burma. This is a later production tank with the long M6 75mm gun.

M3 MEDIUM TANK IN ASIA AND THE AMERICAS

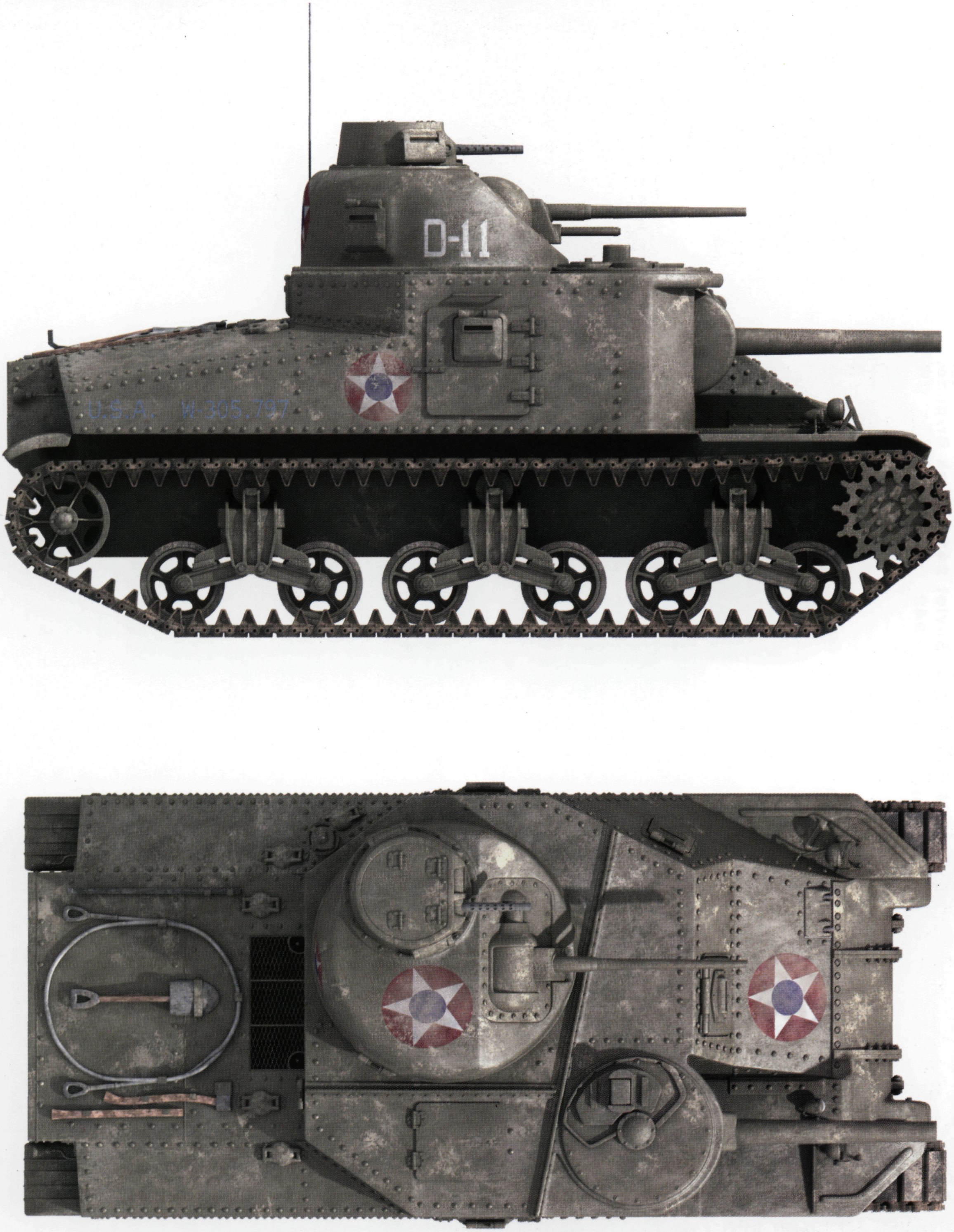
Although the M3 medium tank is best known for its role in the desert campaign of 1942–43, it was also widely used by British and Commonwealth forces in Asia. Even in the summer of 1942, at the height of the desert campaign, nearly a third of the Grants and Lees had been diverted to Asia, as the accompanying chart illustrates.

Burma

Grants and Lees were dispatched to India in significant numbers in 1942 to protect it from possible Japanese attack and in anticipation of combat operations in Burma. In this theater, the M3 medium tank was more than adequate to handle the Japanese tank threat, and the combination of the 37mm and 75mm gun proved to be well suited to infantry close-support. The 37mm gun had a canister round that proved very effective against Japanese infantry, while the 75mm gun was very versatile in attacks against bunkers and other defenses. Even after the arrival of Sherman tanks, the Grants and Lees remained in service until the end of the war.

Small numbers of Grant and Lee tanks were supplied to the Indian Army as it began to mechanize in 1941. The 1st (later 251st) Indian Armoured Brigade received a handful of Grants in April 1941, while the 2nd (later 252nd) Indian Armoured Brigade received both Lee and Grant tanks. The 251st Indian Armoured Brigade was re-equipped with M4A4 Sherman tanks before being committed to action in Burma. The 252nd Indian Armoured Brigade was deployed in Persia (Iran) as an element of the 31st Armoured Division in June 1942 and had two of its regiments equipped with the Grant. It was subsequently deployed in Iraq, near Basra, but was re-equipped with Sherman tanks in May 1943 after being transferred to Egypt. The 254th Indian Tank Brigade began receiving Grant and Lee tanks for two of its regiments in the summer of 1943. This brigade included the 3rd Carabiniers and the 150th Regiment RAC, which took part in the fighting at Kohima and Imphal

A: M3 Medium Tank, Co. D, 2/67th Armored Regiment, 2nd Armored Division, Carolina Maneuvers, November 1941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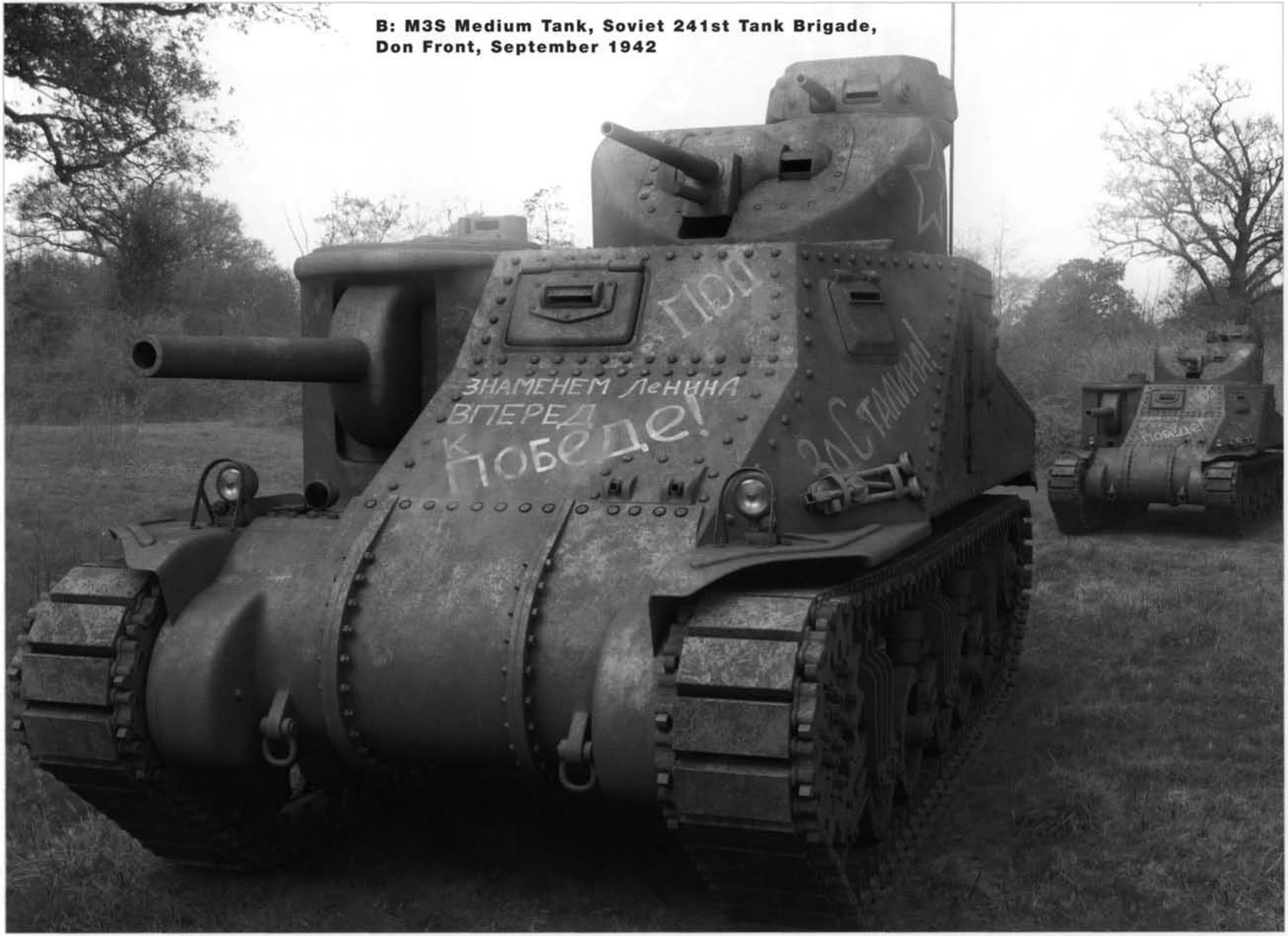

B: M3S Medium Tank, Soviet 241st Tank Brigade, Don Front, September 1942

Под
ЗНАМЕНЕМ Ленина
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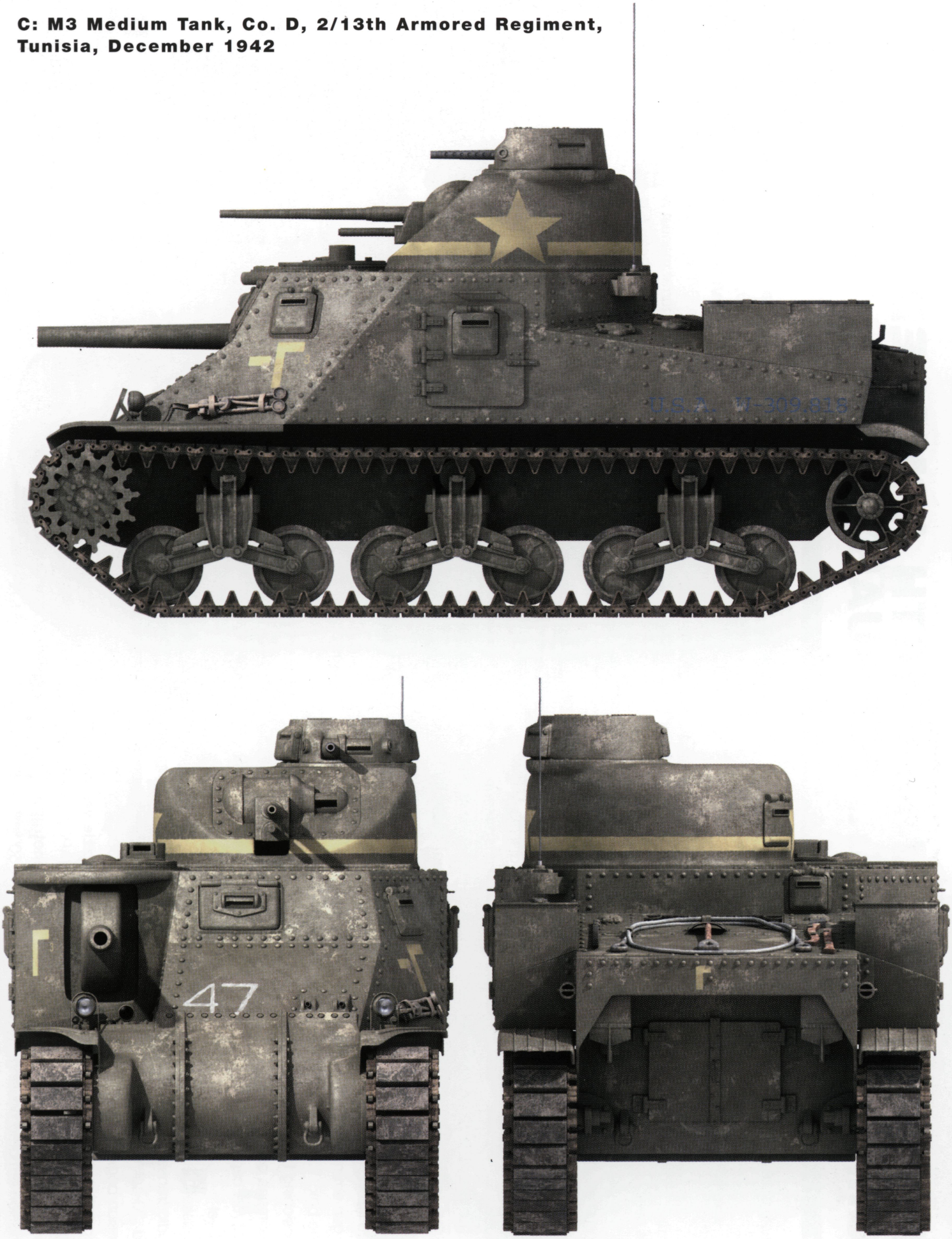
к
Победе!
За Сталина!
Победе!

C: M3 Medium Tank, Co. D, 2/13th Armored Regiment, Tunisia, December 1942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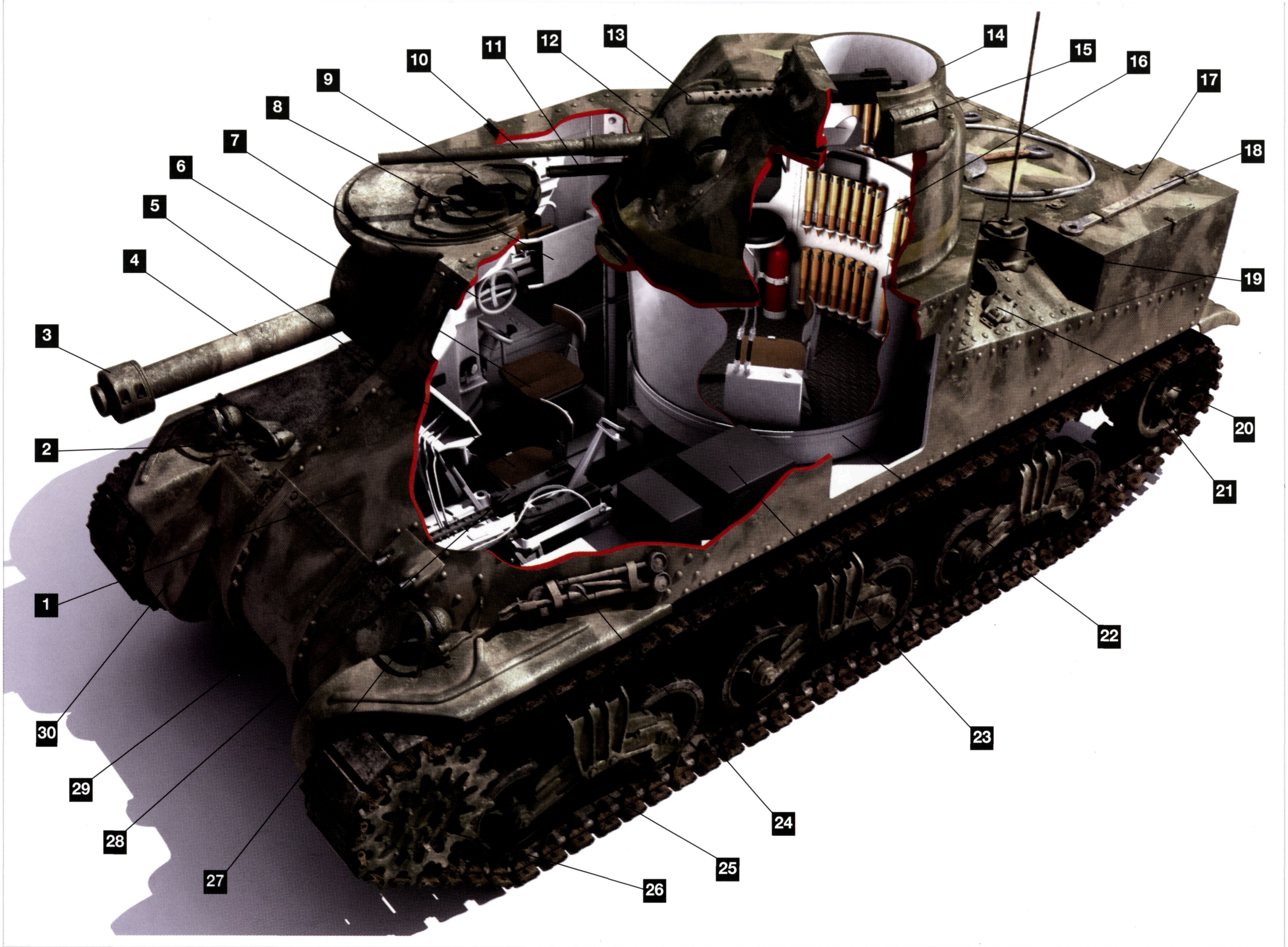
D: M3 MEDIUM TANK, 2/13TH ARMORED REGIMENT, TUNISIA, FEBRUARY 1943

KEY

1 Hull glacis plate
2 Siren
3 Counterweight for 75mm gun stabilization system
4 75mm gun
5 Driver's seat
6 Gunner's seat
7 75mm gun elevation wheel
8 Protective guard for 75mm gun breech
9 Periscopic sight cover for 75mm hull-mounted gun
10 37mm gun
11 37mm gun stabilization counterweight
12 37mm gun sighting port
13 Turret cupola .30-cal. machine gun
14 Turret machine-gun cupola
15 Armored visor for turret cupola
16 37mm gun ammunition stowage
17 Stowage box
18 Idler tensioning tool
19 Radio antenna pot
20 Armored fuel cap
21 Idler wheel
22 Turret basket
23 Tank radio transceiver
24 Stowed .30-cal. machine-gun tripod
25 Suspension bogie
26 Drive sprocket
27 Headlight
28 Two forward-firing .30-cal. machine guns
29 Transmission armored housing
30 Final drive armored housing

SPECIFICATIONS

Crew 6–7 (commander, turret gunner, turret loader, driver, hull gunner, hull loader, optional radio operator)
Combat weight 30.7 tons
Power-to-weight ratio 11.3 hp/t
Overall length 18.5ft
Width 8.9ft
Height 10.2ft
Engine Continental R975 EC2 radial 340hp 9-cylinder gasoline engine with 973cu. in displacement
Transmission Syncromesh transmission with five forward and one reverse gear
Fuel capacity 175gal
Max speed (road) 24mph
Max speed (cross-county) 15mph
Max range 120 miles
Fuel consumption 1.4 gallons per mile
Ground clearance 17in
Armament 75mm M2 gun in M1 mount in hull; 37mm M6 gun in M24 combination mount in turret with co-axial .30-cal. machine gun; two .30-cal. Browning machine guns in hull
Main gun ammunition 50 rounds 75mm; 178 rounds 37mm; 9,200 rounds .30-cal.; 1,200 rounds .45-cal.
Muzzle velocity 75mm gun: 1,930ft/sec (APC); 37mm gun: 2,900ft/sec (M51 APC)
Penetration 75mm M61 APC = 60mm @ 500yds @ 30 degrees; 37mm M51 APC = 53mm @ 500yds @ 30 degrees
Max effective range 75mm: 13,600yds; 37mm: 12,850yds
Gun depression/elevation 75mm: -9 to +20 degrees; 37mm: -7 to +60 degrees
Armor 51mm turret mantlet and turret sides; 51mm hull front, 38mm hull sides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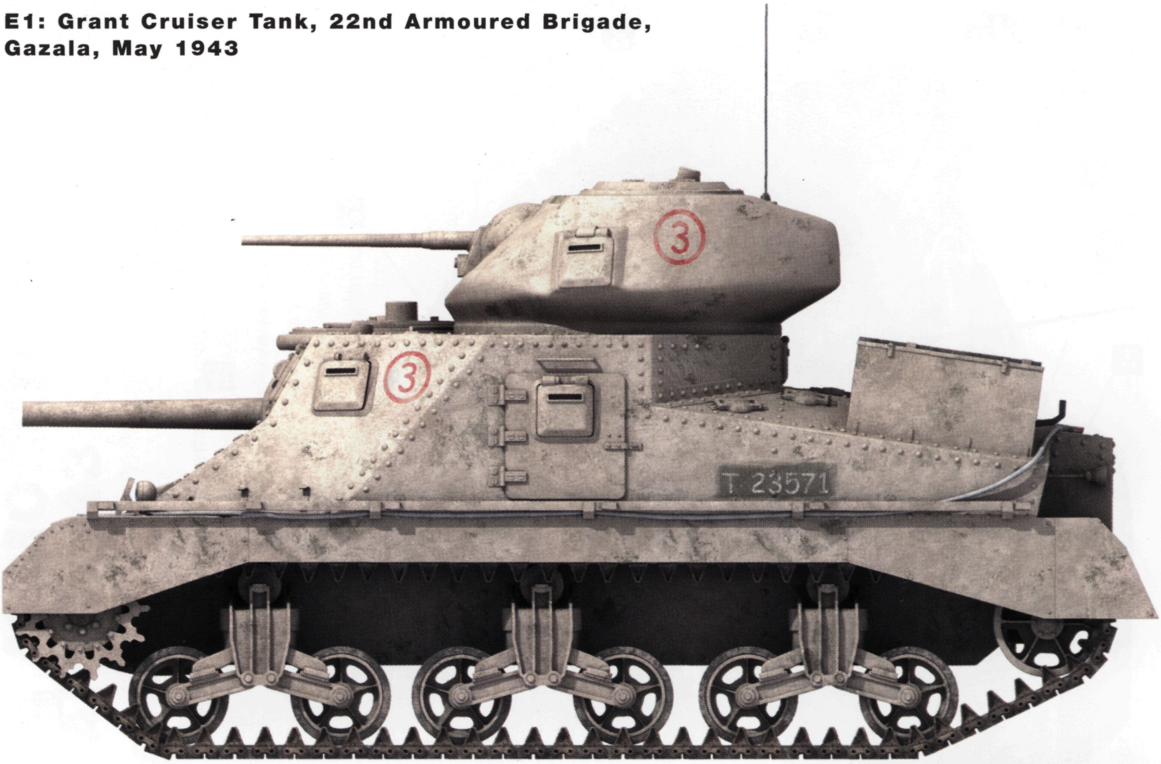
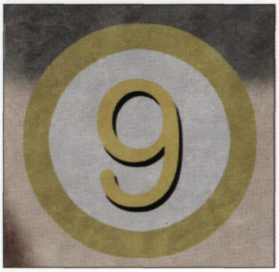
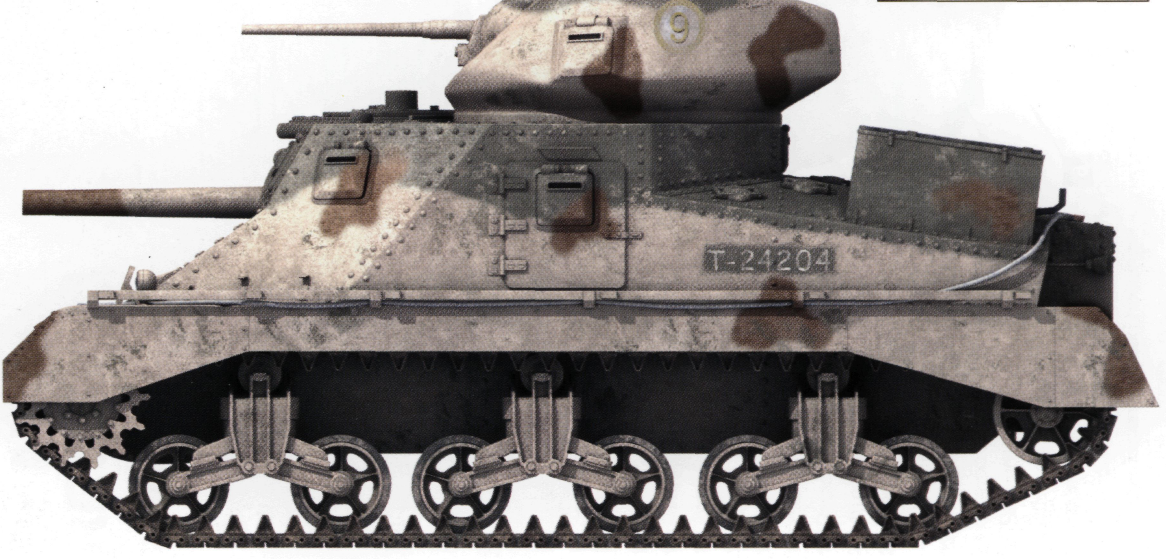
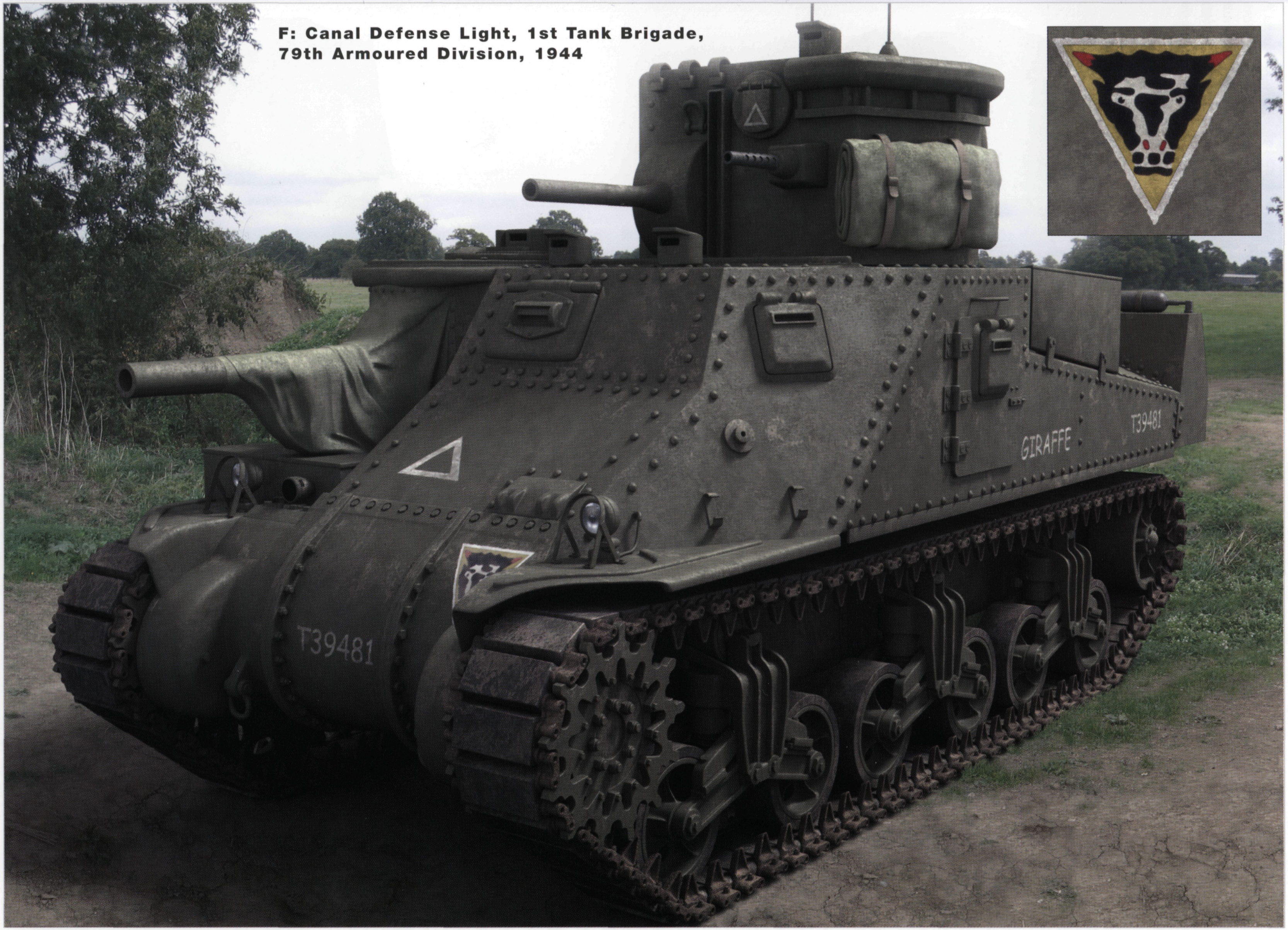
E1: Grant Cruiser Tank, 22nd Armoured Brigade, Gazala, May 1943



E2: Grant Cruiser Tank, C Squadron, 3rd RTR, 4th Armoured Brigade, 7th Armoured Division, Gazala, May 1943







F: Canal Defense Light, 1st Tank Brigade, 79th Armoured Division, 1944

GIRAFFE
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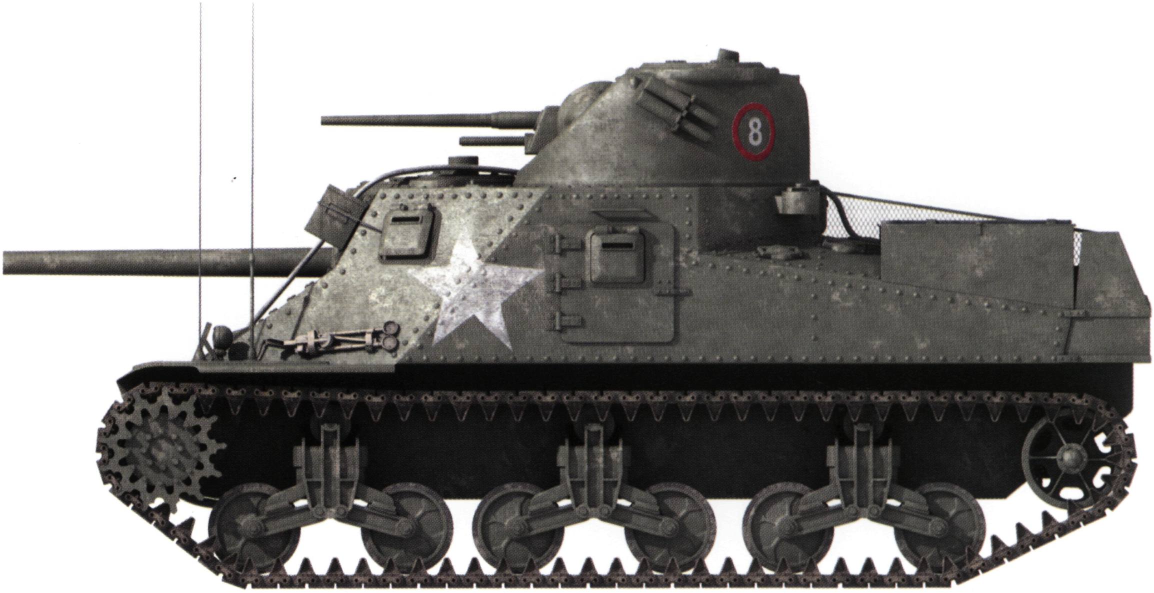
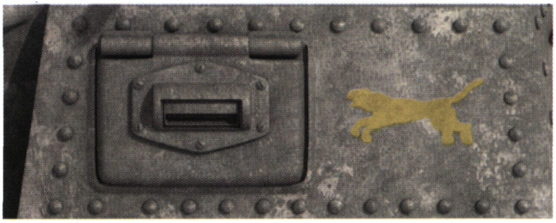
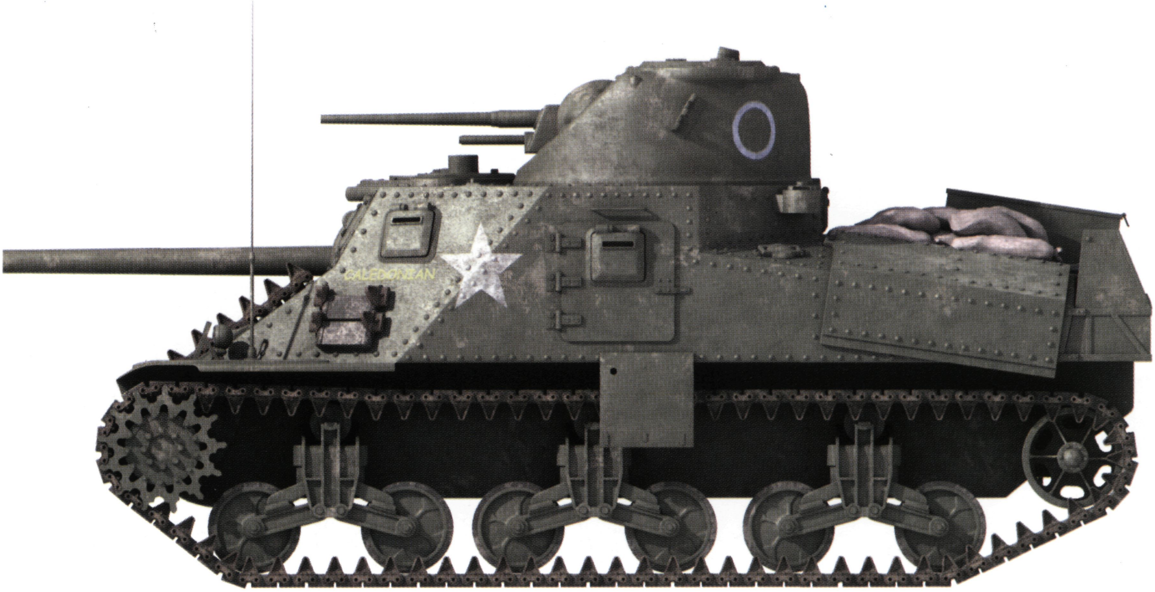
G1: Lee Cruiser Tank, C Squadron, 3rd Carabiniers, Burma 1944





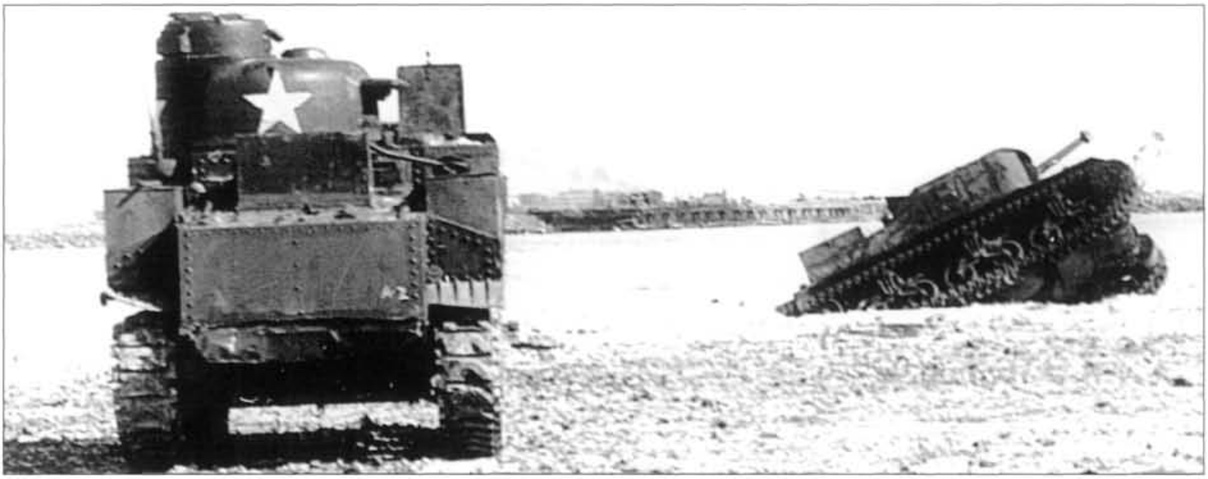

CALEDONIAN

G2: Lee Cruiser Tank, C Squadron, 150th Regiment RAC, Burma 1945

A Lee tank of the 3rd Carabiniers crosses the Irrawady River in Burma on February 26, 1945, during the 33 Corps advance on Meiktila. (NARA)

in Burma in 1944–45. The brigade was commanded by Brigadier R. Scoones, the brother of 4 Corps commander Lieutenant General G. P. Scoones, who argued against the conventional wisdom that tanks had no place in the jungles of Burma. When the second Arakan offensive was launched along the Burmese coast in January 1944, the attack was supported by the 25th Dragoons equipped with Lee tanks. In early February, the Japanese launched the Ha-Go offensive and nearly overwhelmed the 7th Division's headquarters, which withdrew in good order to the administrative "box" at Sinzewa, a defended area hardly 800 by 1,500 yards. The box soon received the support of two squadrons of Lee tanks of the 25th Dragoons, which proved instrumental in the defense and a "continual source of anxiety to the Japanese," according to the divisional history. The box was finally relieved by the 5th Division, supported by remaining Lee tanks. The defeat of the Ha-Go offensive was a turning point in the Burma campaign, and the Lee tanks played a prominent role in the new tactics.

A Lee tank named Cossack of C Squadron, 150th Regiment RAC with troops of the 19th Indian Division advance on Ft Dufferin in Burma on March 10, 1945. (NARA)



The sole combat use of the M3 by the US Army in the Pacific was by the 193rd Tank Battalion, which employed a few M3A5 medium tanks on Butaritari Island in the Makin Atoll in the Gilberts on November 20, 1943, to support the 165th Infantry Regiment. One of the M3A5 tanks appears to have become bogged down in the lagoon while the other is engaging targets on the opposite shore. (NARA)

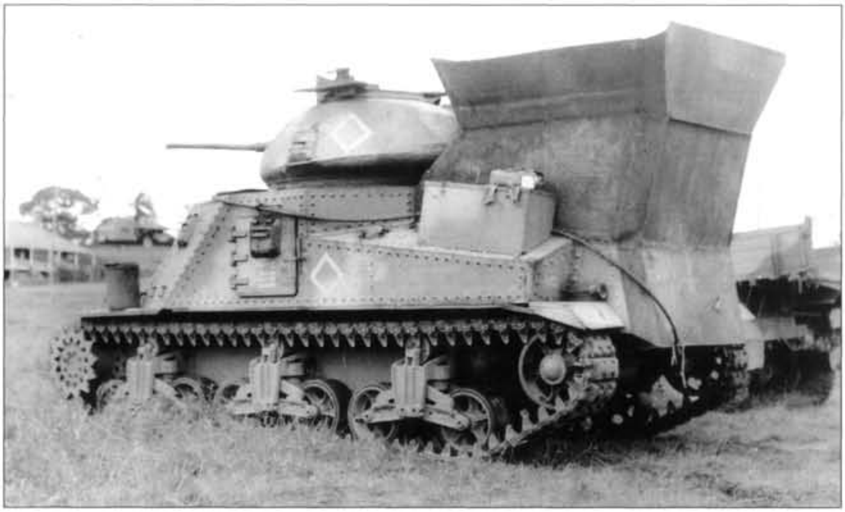
During the Arakan fighting in February, some Japanese magnetic mines were captured and they were tested against a knocked-out Lee tank. Although the mines were ineffective on the side armor, they were capable of blasting through the thinner roof armor of the tank. As a result of this, British and Indian tank units in the Burma theater began experiments to defend against the mine threat, attaching mesh screens over the engine decks.

In March 1944, the Japanese 15th Army launched the U-Go offensive in central Burma. One of its objectives was to cut the road north of Imphal at Kohima. Brigadier Scoones was finally given the chance to prove his theories about the value of tanks in Burma, and the 3rd Carabiniers with Lees and the 7th Indian Light Cavalry with Stuarts were deployed at Imphal. One of the few tank-vs-tank encounters of the Burma campaign occurred on March 20, 1944, when a column from A Squadron, 3rd Carabiniers, was ambushed by six Type 95 light tanks. In the ensuing melee, one Lee was knocked out when its fuel tank was penetrated through the thin side armor, but five Type 95 tanks were turned into burning wrecks by the heavier firepower of the Lees. In the ensuing fighting on the Imphal plain, the Lees provided close support for the grinding infantry battles. The Japanese infantry had few effective antitank weapons except for some of the new 47mm guns, and so often resorted to ferocious close-range attacks.

The successful support of the 3rd Carabiniers led to calls for more tank support, and the Lees of the 150th Regiment RAC and later 149th Regiment RAC were deployed around Kohima. They fought alongside the infantry in the difficult terrain, and were instrumental in destroying bunkers and other defensive works that were otherwise invulnerable to infantry assault. By the end of June the tank units from Kohima had joined up with those on the Imphal plain, marking the defeat of the Japanese U-Go offensive and the greatest defeat sustained by Japanese forces in Burma.

Tanks continued to play a vital role in the subsequent fighting in Burma, but the new Shermans gradually took over much of the burden of the tank fighting. Some units, such as the 3rd Carabiniers and the 150th Regiment, remained with their trusty Lees, and some other new Lee units, such as the 146th Regiment RAC, were deployed in the later fighting. Some Grants were also used in this theater, but the majority were Lees.

This Grant of the Australian 4th Armoured Brigade is seen here in Southport, Queensland, in January 1944, fitted with the locally developed wading kit to permit the tank to cross rivers. It appears to be finished in the usual Australian camouflage scheme adopted in 1942 consisting of Khaki Green No. 3 and Light Stone No. 61. (Australian War Memorial Photo 063073)



Australia

Australia was given priority for Lend-Lease tank shipments in 1942 because of the threat posed by the Japanese operations in New Guinea and the threat of a direct attack on Australia itself. Although these shipments fall under the "UK" totals in Lend-Lease data, these tanks were shipped directly from the United States. By April 1942, 54 M3 medium tanks had arrived in Australia and by the end of the year a total of 757 M3 medium tanks had been shipped. The breakdown by type was 266 Grant (petrol), 232 Grant (diesel), and 239 Lee (petrol). The shipments included a variety of types, including M3, M3A2, M3A3 and M3A5 Grants.

The first tanks were used to equip the 1st Australian Armoured Division. The Australian Army made numerous small modifications to the Grants and Lees in service, some of them patterned on British desert practice, others based on the Burma experiences with the Japanese, such as antimine netting on the engine deck, while others were based on local conditions such as stowage. Some of the specific Australian modifications included the manufacture of a cast steel appliqué for the vulnerable transmission cover based on combat experience using the Matilda tank. A local design of wading trunk was developed both for potential amphibious operations as well as river-crossing operations. Curiously enough, the Australians considered the late-production M3 medium tanks that had substituted a belly hatch for the side escape hatches to be defective in jungle conditions, and there was a scheme to overhaul these tanks and add side doors. This did not take place, nor did some other plans, such as a Grant with the Australian Cruiser Tank Mk. III turret with a 25-pdr gun, a Grant with a Frog flamethrower, or a Grant with a hedgehog rocket projector. The shortage of specialized engineer vehicles led to a number of local modifications, including the development of a tank recovery vehicle based on the Lee, and the adaptation of the US M1 dozer blade to the Grant.

Apart from the use of Stuarts in the Papua New Guinea campaign, most of the later use of Australian armor in 1944–45 involved the limited use of Matilda infantry tanks. The Australian 2/1st Armoured Brigade had three Grant M3A5 tanks on hand for HQ defense. Since they were not needed for this mission, they were converted to support the Matildas by fitting a Sherman M1 dozer blade to the front of the tank. While not particularly significant in itself, these Dozer Grants were landed at Balikpapan, and, although they did not see combat, represented the only time that the Australian Grants were deployed in combat in World War II. The 4th Armoured Brigade, with both of its regiments equipped with Grants, was slated to take part in clearing the Japanese from Java, but the surrender happened so quickly that this did not take place. After the war, the army disposed of the Grants with Continental radials in favor of the diesel types, and they remained in service in declining numbers until the last was retired in October 1955.

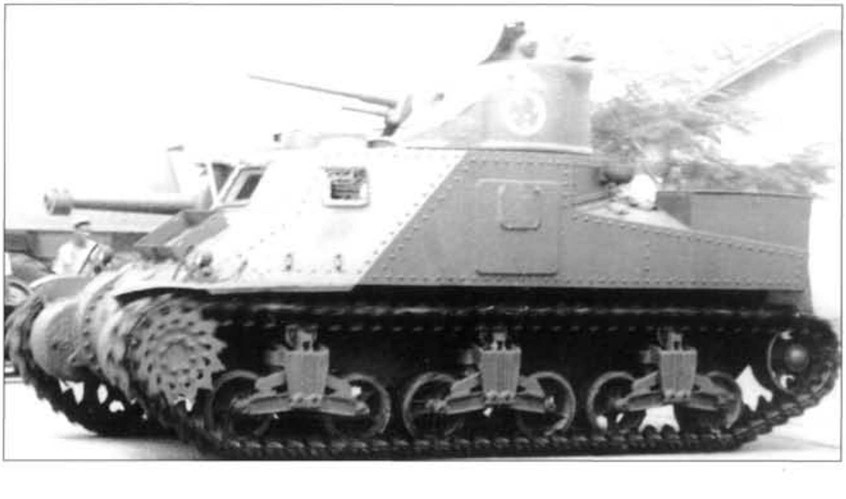
The US Army used the M3 medium tank in combat in the Pacific on only one occasion. The 193rd Tank Battalion deployed a few M3A5 medium tanks on Butaritari Island in the Makin Atoll in the Gilberts on November 20, 1943, to support the 165th Infantry Regiment. There were a few Japanese Type 95 light tanks on the atoll, but there was little if any tank-vs-tank fighting. The US Marine Corps never operated the M3 medium tank, waiting instead for the M4.

US M3 LEND-LEASE SHIPMENTS

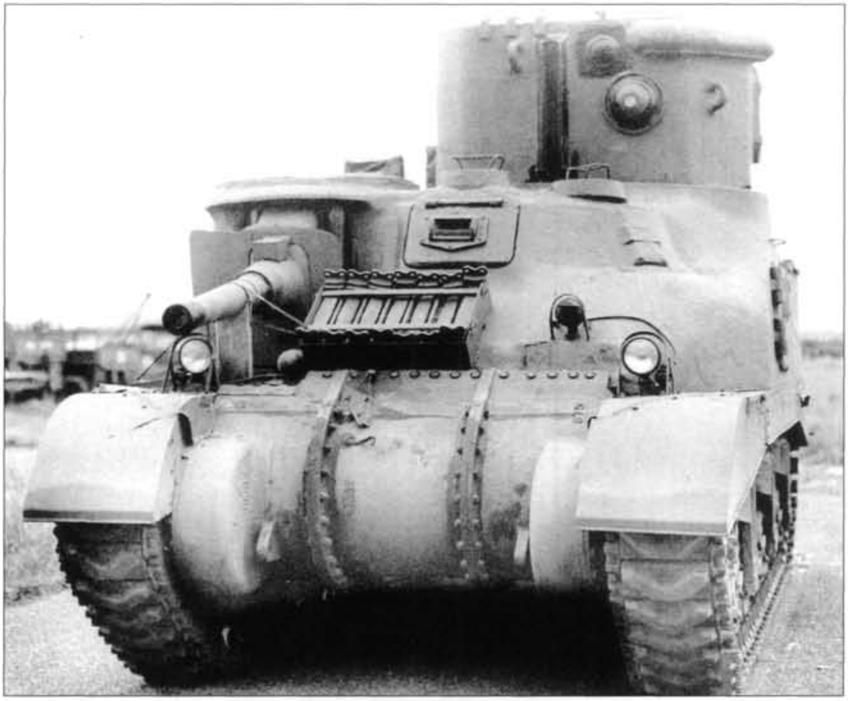
	1941–42	1943	Total	Notes
Britain	2,643	212	2,855	*Includes 49 M3A3, 185 M3A5.*
USSR	1,386		1,386	*Only 976 arrived, rest sunk in transit.*
Brazil	75	21	96	*Other sources indicate 104 delivered.*
Total	**4,104**	**233**	**4,337**	

Lees in the Americas

The Canadian Army planned to acquire the locally built Ram cruiser tanks as mentioned earlier. However, when the 5th Armored Division arrived in Britain for training in the autumn of 1941, Ram production was so behind schedule that it was allotted a variety of Lend-Lease types, including the Lee. Even after the Rams began to arrive, some Lees were still used. For example, in May 1942, the division had 33 Rams and 47 Lees. The Lees were gradually replaced and never used in combat by Canadian troops.



The Brazilian Army used the M3 medium tank well into the 1950s. This is an M3A5 that has been rebuilt with a Continental radial engine prior to being turned over to the Paraguayan Army in the mid-1950s. (USAOM-APG)



The US-built Leaflet tanks, also known as T10 Shop Tractors, were built primarily on the M3A1 cast hull. They were rebuilt with the ultimate M3 series upgrades, including the splinter shield around the 75mm gun and the extra ventilators. (Patton Museum)

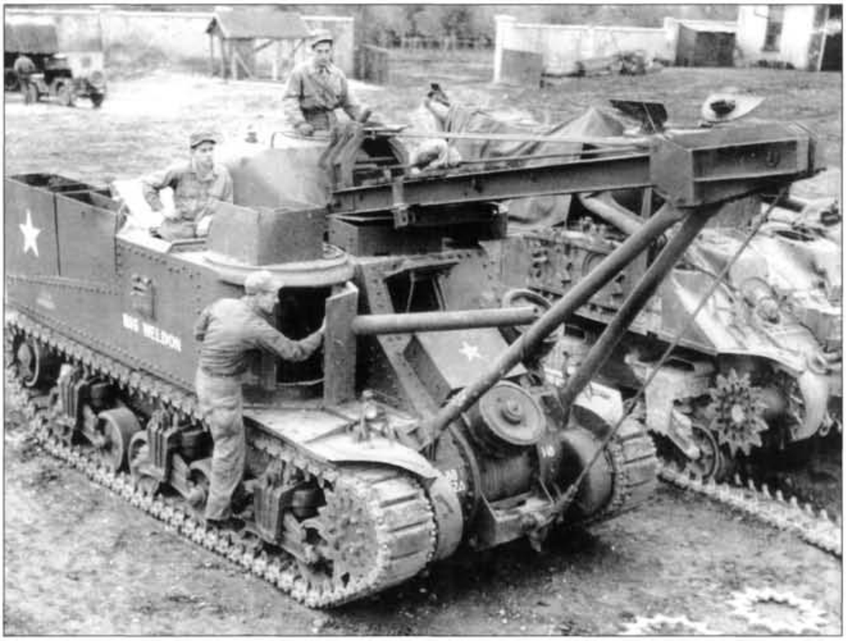
In the wake of the Tunisian campaign, the US Army retired most of its M3 medium tanks from service, even from training duties. The M3 was declared limited standard in April 1943 and declared obsolete a year later. In fact, by September 1943, there were no M3 medium tanks deployed with tank units in the United States, even for training, though a few remained in use overseas.

Brazil was one of the few other recipients of the M3 medium tank via Lend-Lease, receiving 104 M3 tanks and M31 TRVs. These were not sent to Italy with the Brazilian Expeditionary Force in 1944, so they saw no combat in World War II. They remained in service with the Brazilian Army well into the 1950s, and some of the diesel-engine tanks were rebuilt with Continental radial engines at the Parque Central de Motomecanização in the early 1950s. A small number of these rebuilt M3 medium tanks were supplied to Paraguay in the 1950s.

M3 VARIANTS

Night-fighting tanks

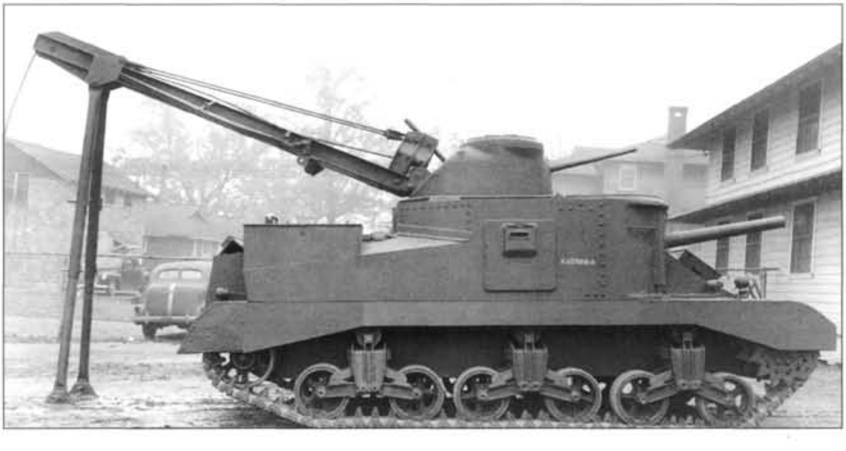
A scheme to mount high-intensity searchlights on tanks to permit night-time tank attacks was first attempted in the 1930s, and the British Army conducted trials in June 1940. The concept proved so promising that the production of 300 turrets was authorized and the entire effort cloaked in a veil of intense secrecy. The War Office felt that such a scheme would be most effective if used as a surprise weapon. The project was given the cover name of Canal Defence Light (CDL). A formation of CDL tanks would illuminate the battlefield with intense beams of light, blinding the German defenders while making their positions evident to the attacking force. To further confuse the defenders, the searchlights could have their



"Big Weldon," an M31 TRV of Co. B, 752nd Tank Battalion, near Udine, Italy, in November 1944. As is evident in this view, the front-hull gun was a dummy covering a new access hatch into the hull. (NARA)

beams emitted in a flickering pattern, and color filters could be used to confuse antitank gunners about the actual range of the attacking CDL tanks. The original plan was to mount the turrets on the Matilda tank, but they were later transferred to the Grant, as this permitted the tank to retain a 75mm gun and operate the turret at the same time. In 1944, Grant CDL tanks were deployed in the three regiments of the 1st Tank Brigade with "Hobart's Funnies," the 79th Armoured Division, which concentrated the British specialized armor under a single command.

The US Army was shown the CDL tank in October 1942 and decided to form six special tank battalions equipped with a US copy. The US effort was codenamed "the Cassock Project," and the American CDL tanks were given the cover name of T10 Shop Tractors and the codename "Leaflet" for operational use. Most Leaflet tanks were based on the M3A1 cast-hull tank instead of the riveted-hull M3 Grant/Lee used on the British CDL tanks. By the spring of 1943, the M3 was out of production, so a contract was given to ALCO to re-manufacture and convert the tanks. A total of 497



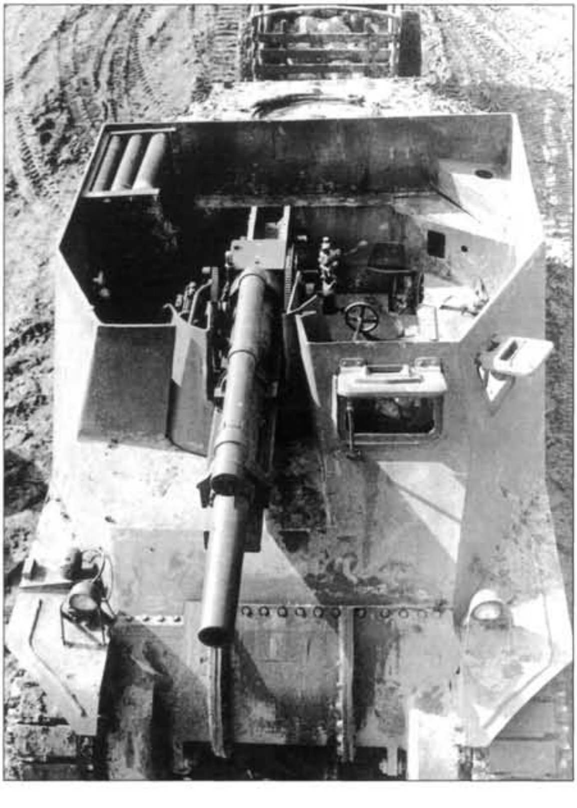
The M31B1 TRV was based on the welded hull M3A3 tank and one named "Katrinka" is seen here at Ft Knox in 1944 while being tested by the Armored Force Board. Note the false barrel on the turret rear. (Patton Museum)

Leaflets were converted from June 1943 to early 1944. These incorporated some changes that were intended for final-production M3 medium tanks, such as the splinter shield around the 75mm gun.

Although the CDL concept held great promise, the intense secrecy around the project proved to be its undoing. Senior commanders were not aware of the program and its potential, and use of the tanks was encumbered by an agreement under which the British and American sides agreed to coordinate their actions before any were put into use. By the autumn of 1944, the US Army was so short of tank battalions in Europe that all six Leaflet battalions were converted to normal tank battalions or mine-clearing battalions. Likewise, the units of the 1st Tank Brigade were reorganized in October 1944. However, some far-sighted officers realized that the CDL tanks might still have some use, and a number were brought forward in the spring of 1945 to help defend bridges over the Rhine from German night attacks. The US Leaflet tanks saw a handful of combat engagements in the final months of the war in this role, and B Squadron of 49 APC Regiment also employed the British CDL tanks in the Rhine and Elbe operations.

Flamethrower tanks

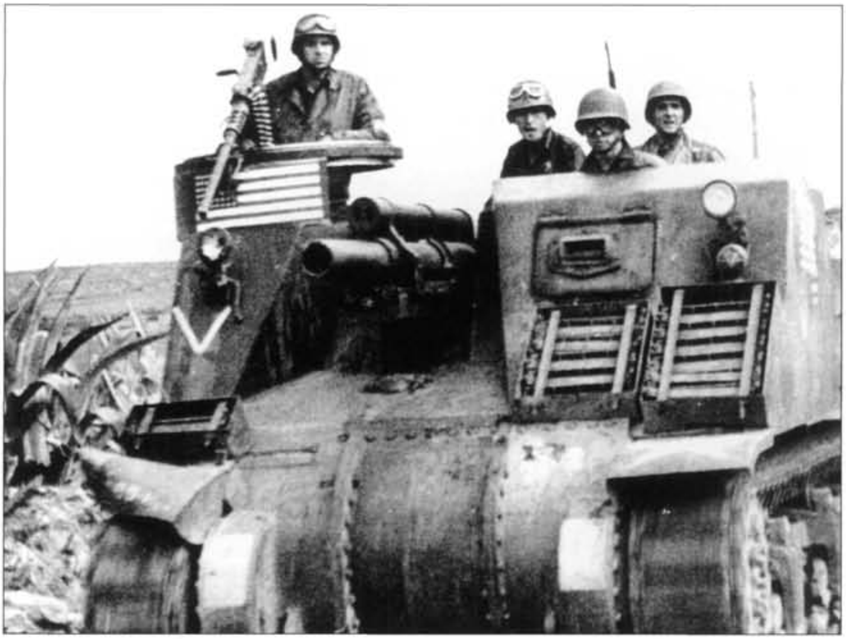
There were numerous attempts to mount flamethrowers on medium tanks, but none were successful until 1944. The experimental E2 flamethrower was mounted in the turret of an M2 medium tank in 1940–41. In August 1942, a less cumbersome and improved version, the E3, was mounted in the turret of an M3 for trials, but there was little service interest.



The T32 pilot of the M7 105mm HMC lacked the distinctive machine gun ring-mount on the right hull side and retained a hull configuration more similar to the original M3 medium tank. (Patton Museum)

Tank recovery vehicles

One of the most numerous and important M3 tank derivatives was the M31 tank recovery vehicle (TRV), also known by its original experimental designation as the T2. By 1942 the Armored Force recognized the need for a tracked vehicle to help recover damaged tanks from the battlefield. Since the US Army was replacing the M3 medium tank with the M4, surplus M3 tanks seemed the most obvious candidates for conversion. In late September 1942, a program began to convert 750 M3 tanks into the T2 TRV configuration. The T2 had the 75mm gun replaced by a dummy gun, and the 37mm gun removed and replaced by a special crane that was linked to a 30-ton-capacity winch mounted inside the crew compartment. Baldwin began the conversion in October 1942 and completed 509 M31 TRVs throughout December 1943. There was enough demand for the vehicle that Baldwin was given two further contracts, one for the construction of 150 new TRVs on the M3A3 chassis, and another for the conversion of 146 M3A3 and M3A5 medium tanks. All were completed by the end of 1943 and the vehicles were type-classified in August 1943 as the M31 when



The early production M7 105mm HMC, as seen here in Tunisia in December 1942, shows clear evidence of its M3 medium tank lineage, such as the small cut-out on the upper portion of the right transmission casting, a hold-over to provide clearance for the 75mm sponson gun. The M7 gradually took on more and more characteristics of the M4 Sherman tank series, and so is usually considered a Sherman derivative. (NARA)

using the M3 chassis, the M31B1 on the M3A3, and the M31B2 on the M3A5. The M31 TRV was widely used in US armored units in 1944–45, though it was superseded in production by the M32 based on the M4 chassis in 1944.

The British converted redundant Grant and Lee tanks to the Grant ARV I (armored recovery vehicle) by removing the turret and fitting various tools, including a small jib crane that could be fitted to the front of the vehicle. This recovery vehicle was much simpler than the M31, and the British Army obtained 104 M31 and M32 through Lend-Lease, which they called the Grant ARV II. The Red Army was sent 127 M31 in 1943–44. France received a number of M31s outside Lend-Lease channels in armored units of the French First Army, part of the US 6th Army Group. Australia conducted its own ARV conversion, which fell somewhat between the M31 and ARV I in complexity, having a large rear spade to assist in winching, but without a large heavy-duty crane.

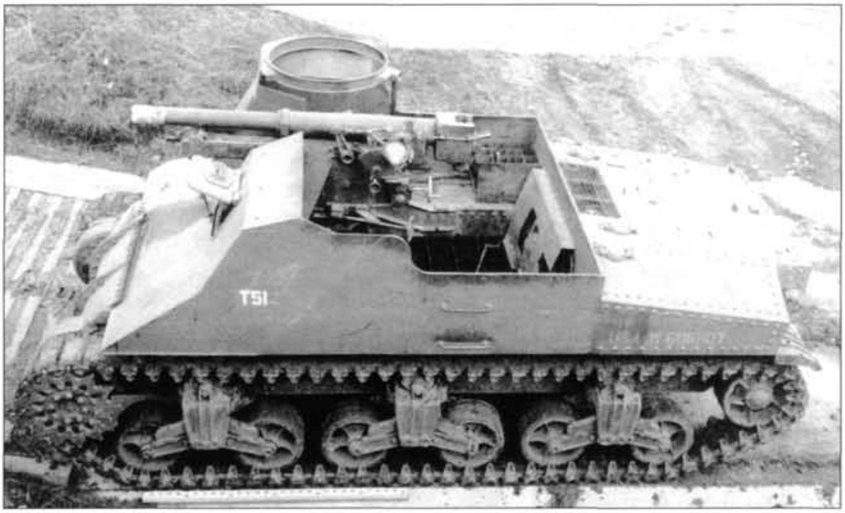
M31 TRV CONVERSION/PRODUCTION

	Dec 42	Jan 43	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
M31*	10	40	23	45	46	40	56	50	33	42	50	46	28	509
M31B1/B2*			3						37	49	40	16	1	146
M31B1	1	16	14	17	18	18	30	17	18	0	0	1		150

*Conversion

Self-propelled artillery

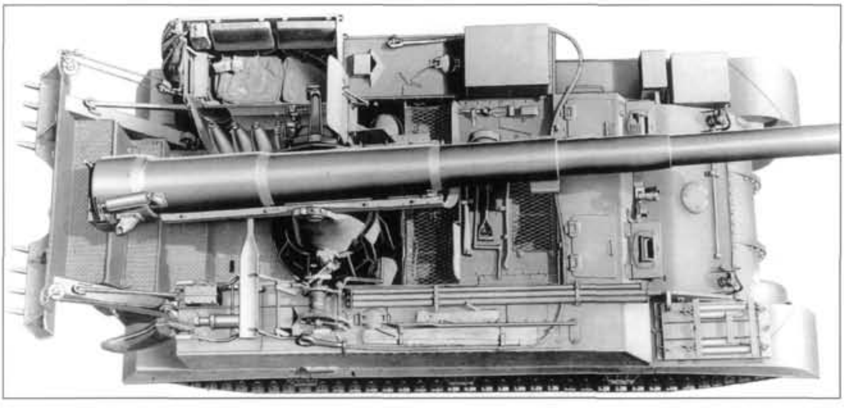
The US Armored Force wanted its field artillery to be mechanized, and in October 1941 Major General Jacob Devers asked Ordnance to develop a suitable design for the standard 105mm howitzer. Two pilots of the T32 105mm howitzer motor carriage (HMC) were built on M3 medium tank chassis and entered testing in February 1942. The Armored Force also wanted a .50-cal. machine mount for self-defense, so the second pilot was



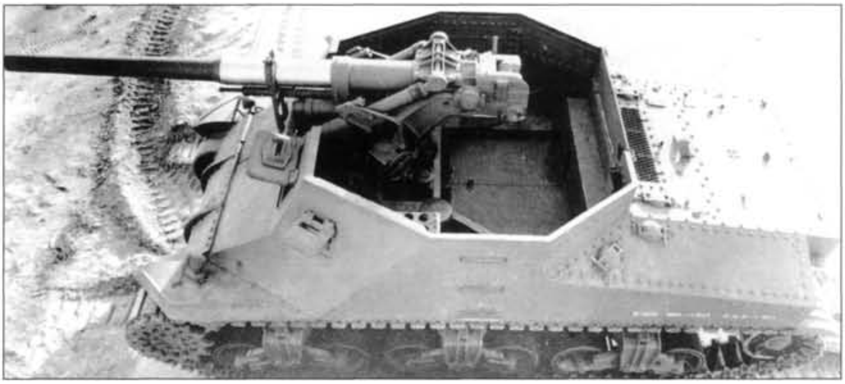
The T51 25-pdr HMC was an attempt to develop a Lend-Lease equivalent of the M7 105mm HMC using the British 25-pdr. Since Canada was producing the Sexton on the Ram chassis, this vehicle was unnecessary. (Patton Museum)

reconstructed with a ring mount on the right corner of the fighting compartment. The design was accepted for service in April 1942 as the M7 105mm HMC and entered production immediately. The M7 was the most important self-propelled artillery weapon of the US Army in World War II and remained in production long after M3 production had ended. The M7 gradually absorbed many of the production changes of the M4 medium tank, and, as a result, is often considered a derivative of it.

The US Army also began work on a similar vehicle armed with the British 25-pdr called the T51, but work on this was curtailed when it became evident that Canada was developing such a weapon on the Ram tank in late 1942, called the Sexton. The Sexton became the most significant self-propelled howitzer in British and Commonwealth service during the war, but its story is largely outside the scope of this study apart from its indirect link to the M3 medium tank. Curiously enough, the Australian Army decided to convert a number of surplus M3 tanks after World War II into self-propelled howitzers patterned after the Sexton. The project began in July 1949 using the Grant III, and the result closely resembled the Sexton except for side access doors. These were called Yeramba, and Ordnance Factory Bendigo converted 13 between November 1950 and early 1952. The 22nd Field Regiment (SP) used these until 1956 when they were retired.



The M12 155mm GMC mounted the World War I 155mm GPF gun on a modified M3 medium tank chassis, with the powerplant moved into the center of the hull, as is evident in this view. (NARA)

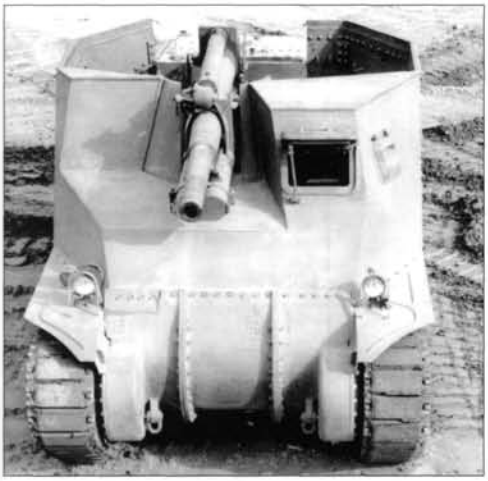


The T23 3-inch GMC was the first attempt at building an expedient tank destroyer on the M3 chassis, but the gun was mounted too high. (Patton Museum)

In June 1941, another US Army artillery vehicle on the M3 tank was started, mounting the World War I GPF 155mm gun. In this case, there was far less user interest, as the field artillery was content to use towed weapons in this caliber. A pilot was completed as the T6 155mm GMC and entered tests in February 1942 at APG. In spite of a lack of interest by the artillery branch, production was eventually authorized for the manufacture of 100 M12 155mm GMCs at the Pressed Steel Car Company from September 1942 until March 1943. Once again, the production extended beyond M3 medium tank production, so the M12 is often considered a Sherman derivative. A related carrier for 155mm ammunition was built alongside it as the M30 cargo carrier. Both the M12 and M30 were largely ignored until December 1943 when the Army Ground Forces recognized that they might be useful as direct-fire weapons in the forthcoming campaign in France. A total of 74 M12s and the same number of M30s were rebuilt and modernized by Baldwin in February–May 1944 and brought up closer to the standards of the current M4 medium tank. They were deployed with several field artillery battalions in 1944 and proved enormously useful for attacking German bunkers and other defenses in the direct-fire role.

Ordnance also considered the M3 chassis for antiaircraft artillery. In November 1941, the T26 75mm GMC was approved, which consisted of a T6 75mm antiaircraft gun and associated fire-control equipment in a new turret on the M3 chassis. It was not completed, as Ordnance quickly appreciated that the weapon was poorly suited to the antiaircraft role because of its low velocity. Instead, the uncompleted pilot was set aside for a similar scheme, the T36 40mm GMC, which used the 40mm Bofors gun instead. There were serious delays in the program owing to the complexity of the fire controls, and the program was eventually cancelled in July 1943 in favor of other alternatives such as the T52 40mm GMC on the M4 medium tank chassis.

Besides gun carriages, the M2 and M3 also served as the basis for a number of attempts to develop a tracked prime mover for heavy artillery. The T2 heavy tractor was based on components from the M2A1 medium tank, but trials in 1941–42 were unsatisfactory. It was followed by the T16, based on the M3A5 medium tank chassis. Although it was automotively acceptable, internal stowage was inadequate and the project was ended in 1943 in favor of unarmored tractors such as the T23, which was later type-classified as the M6 high-speed tractor, but suffered from a prolonged gestation. Since there was an immediate need for a tractor to



The M9 3-inch GMC was accepted for production for the tank destroyer force but was soon cancelled because of a shortage of suitable 3-inch guns and the disdain of the Tank Destroyer Center. The M9 (T40) bears some resemblance to the T32 pilot for the M7 105mm HMC. (Patton Museum)

tow heavy artillery, the Chester Depot converted 109 M31 TRVs into the M33 prime mover from December 1943 to March 1944. This involved removing the turret and crane assembly, though the internal winch was retained. These were used primarily to tow super-heavy artillery, such as the 8-inch gun M1 and the 240mm howitzer.

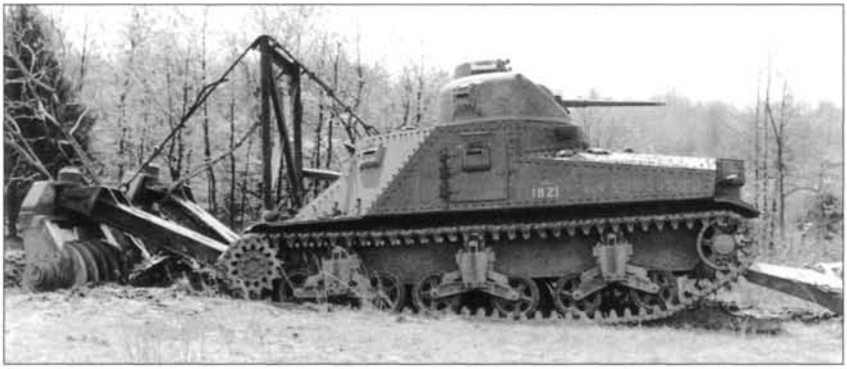
Tank destroyers

The US Army recognized the need for specialized antitank weapons in 1940 and considerable experimentation was undertaken in 1940–41 on various wheeled and tracked chassis. In September 1941, Ordnance sponsored the T24 3-inch GMC, consisting of a turretless M3 medium tank chassis with a 3-inch antiaircraft gun mounted centrally in the fighting compartment. Trials starting in November 1941 found the vehicle to be practical, but the consensus was that the weapon was located too high, and the vehicle was rebuilt by Baldwin into the new T40 configuration with the gun mounted lower in the superstructure. This was far more satisfactory and it was accepted as the M9 3-in GMC in May 1942. In spite of this, no production ensued, as the new Tank Destroyer Center was very critical of the expedient nature of the design, and only 27 of the M1918 guns were available for conversion. The new turreted M10 3-in GMC was a far superior alternative and so the M9 faded into well-deserved oblivion.

Combat engineer vehicles

The British Army used the Grant as the basis for one of the early mine-clearing tanks, the Grant Scorpion III. This had a flail device mounted on the front of the tank, and it was first put into operational use in Tunisia in 1943. It was subsequently used in later campaigns in Italy but gradually gave way to devices mounted on the Sherman tank.

The US efforts at mine clearance focused on mine exploders using rollers rather than flails. The T1 mine exploder was tested on an M3 medium tank at APG in early 1943. The device had many shortcomings but evolved into the T1E1 Earthworm mine exploder employed with the M32 TRV. There was at least one field expedient mine-clearing system mounted on an M3 by the Fifth Army Engineer Training Center (FAETC) in North Africa in 1943, which was a Rube Goldberg contraption using a rotating crane that dropped explosive charges in



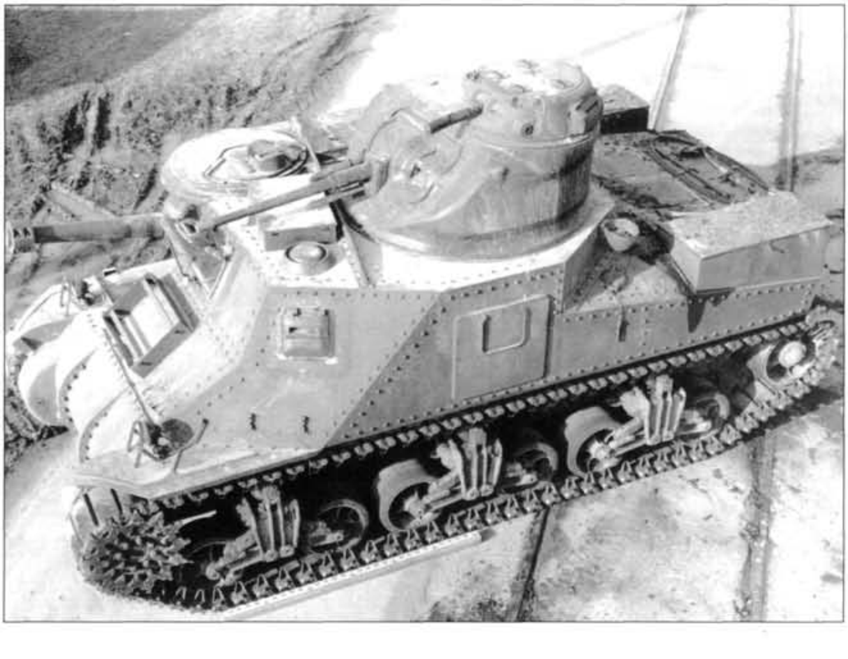
The T1 mine exploder was an early attempt to solve the mine problem, but the unpowered rollers were too easily bogged down in soft soil, as seen here. (Patton Museum)

front of the tank to clear a path. The program was continued later in the US in a modified form on the M4 tank as the Pancake device, but never proved practical. Curiously enough, records of the 1st Armored Division in Tunisia indicate that the 16th Engineers had six M3 medium tanks with "mine crushers" in late April 1943 during the fighting around Mateur, and these may have been Scorpions borrowed from the British.

BIBLIOGRAPHY

This account is based primarily on official US Army records including the chapter on M3 development in the Office of Chief of Ordnance history, *The Design, Development and Production of Tanks in World War II*, Vol. 1, which was declassified in 1962. Various Ordnance files in RG156 in the US National Archives and Records Administration, College Park, MD, were also consulted, as well as after-action reports of various US tank battalions in RG407.

The best published account of M3 development is the chapter in Richard Hunnicutt's classic *Sherman: A History of the American Medium Tank* (Taurus, 1978). There are many accounts of the use of the Grant by British forces in the desert campaign, including classics such as the second volume of Basil Liddell Hart's *The Tanks: The History of the Royal Tank Regiment* (1959), as well as numerous regimental histories. Bryan Perrett's *Tank Tracks to Rangoon* (Robert Hale, 1978) remains the best account of the tank fighting in Burma, though his earlier title in the Osprey Vanguard series (Vanguard 6: *The Lee/Grant Tanks in British Service*, 1978) is also useful. The best account of the M3 medium tank in use by the US Army in Tunisia is the memoir by the 13th Armored Regiment commander, Paul Robinett, *Armor Command* (McGregor & Werner, 1958). The best account of the Australian use of the Grant/Lee is the material by Paul Handel on the Anzac Steel internet site.



A useful view of an intermediate production M3A5, serial 1465, at APG in December 1942 showing some of the improvements, such as the gun counterweights, welded side doors, added ventilators, and grouser stowage boxes. (NARA)

COLOR PLATE COMMENTARY

A: M3 MEDIUM TANK, CO. D, 2/67TH ARMORED REGIMENT, 2ND ARMORED DIVISION, CAROLINA MANEUVERS, NOVEMBER 1941

US tanks in 1941 were finished in lusterless olive drab paint with blue drab registration numbers painted on the rear sides. The US Army did not employ any form of national insignia prior to 1942, though in the autumn of 1941, some armored vehicles, including tanks of the 2nd Armored Division, began carrying the Army Ground Forces (AGF) star, which was the same as the Army Air Force (AAF) insignia but with the colors reversed. This was very short-lived. After Japan attacked Pearl Harbor in December 1941, the US Army realized that the red circle could be easily mistaken for the Japanese *hinomaru* at a distance. A white star without a roundel was subsequently adopted as the standard AGF marking. The 2nd Armored Division adopted the practice of carrying on the turret a tactical number preceded by the company letter, as seen here.

B: M3S MEDIUM TANK, SOVIET 241ST TANK BRIGADE, DON FRONT, SEPTEMBER 1942

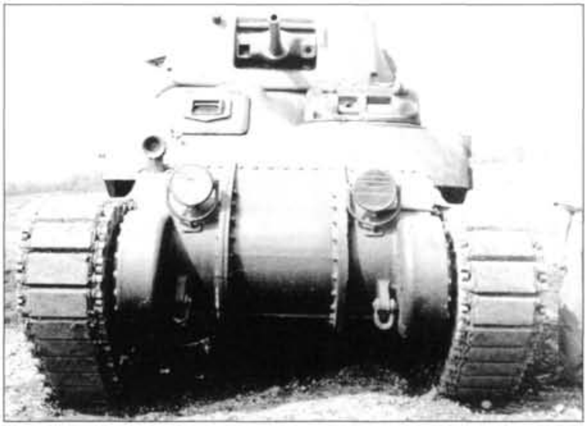
Soviet Lend-Lease tanks generally remained in their delivery paint of olive drab, except on rare occasions when they were camouflage-painted. The use of political slogans was a frequent feature on Soviet tanks in 1942, and this one carries the slogan *Za Stalina!* (For Stalin) on the front side, and *Pod znamenen Lenina vpered k pobede!* (Under the banner of Lenin, forward to victory) on the front. The use of the red star national insignia was not very common on wartime tanks, but sometimes a variation using a simple white outline was seen, as here. This brigade was hastily committed without proper training to the fighting north of Stalingrad and suffered such heavy losses that it was disbanded in October 1942.

C: M3 MEDIUM TANK, CO. D, 2/13TH ARMORED REGIMENT, TUNISIA, DECEMBER 1942

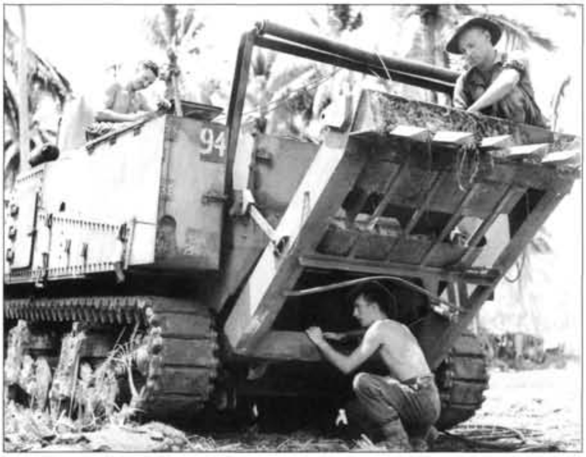
In January 1942, the Armored Force ordered the use of a yellow star and bar insignia, distinct from the white star adopted elsewhere in the army, to reduce their visibility. Color film footage of the 2/13th Armored in Tunisia shows their M3 medium tanks retained these yellow insignia, although many units at the time had reverted back to white for convenience. The 1st Armored Division adopted a complicated set of geometric markings in 1942 to identify each tank company, and the 2/13th Armored used a vertical bar with a moving square pip on the right. The pip at the top indicated Co. D, in the middle Co. E, and at the bottom, Co. F. It was accompanied by the platoon number to the right. During operations in Tunisia, the battalion began the practice of crudely painting a white tactical marking on the bow, as seen here. Some of the numbers that have been seen in film footage were 40, 44, 47, and 56. After the heavy losses suffered at Terbourba in December 1942, the battalion began camouflaging their tanks by applying irregular patterns of local mud over their dark olive drab finish.

D: M3 MEDIUM TANK, 2/13TH ARMORED REGIMENT, TUNISIA, FEBRUARY 1943

See plate for full details



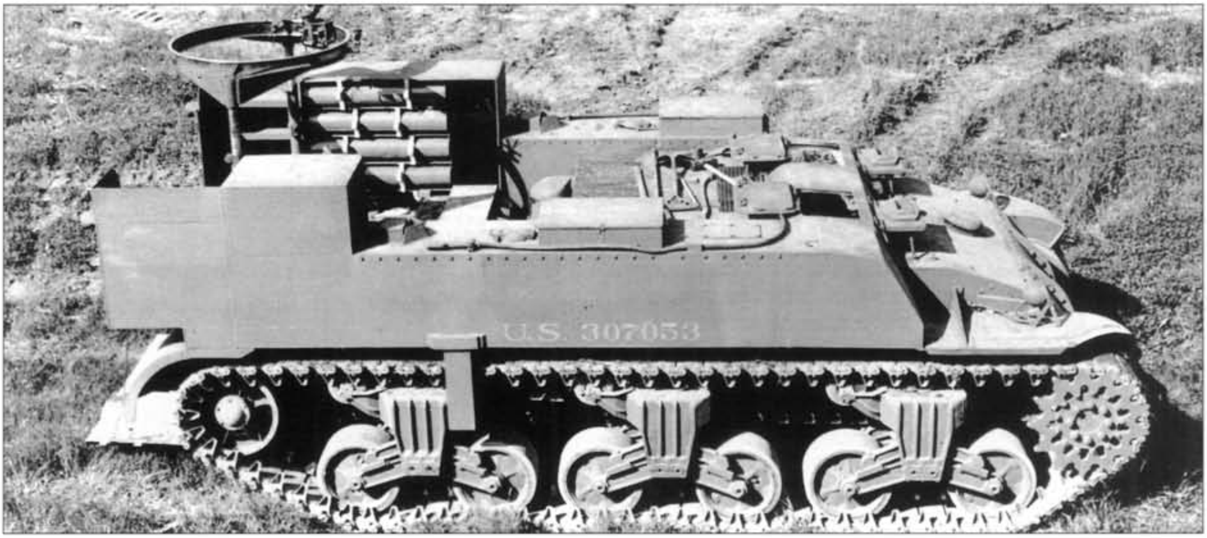
ABOVE **The Cruiser Tank M3 (Canadian), later called the Ram I, was the Canadian derivative of the M3, using the M3 lower hull but with a new cast upper hull and turret. One of the pilots is seen here on trials at APG on August 16, 1941. (USAOM-APG)**



ABOVE **A crew from the Australian Electrical and Mechanical Engineers work on a Grant of the 2/4th Armoured Regiment being converted into a recovery tank in September 1944. One of the distinctive features of the Australian TRV was the use of a rear spade to improve the performance of the winch for recovering bogged-down tanks. (Australian War Memorial Photo 075964)**

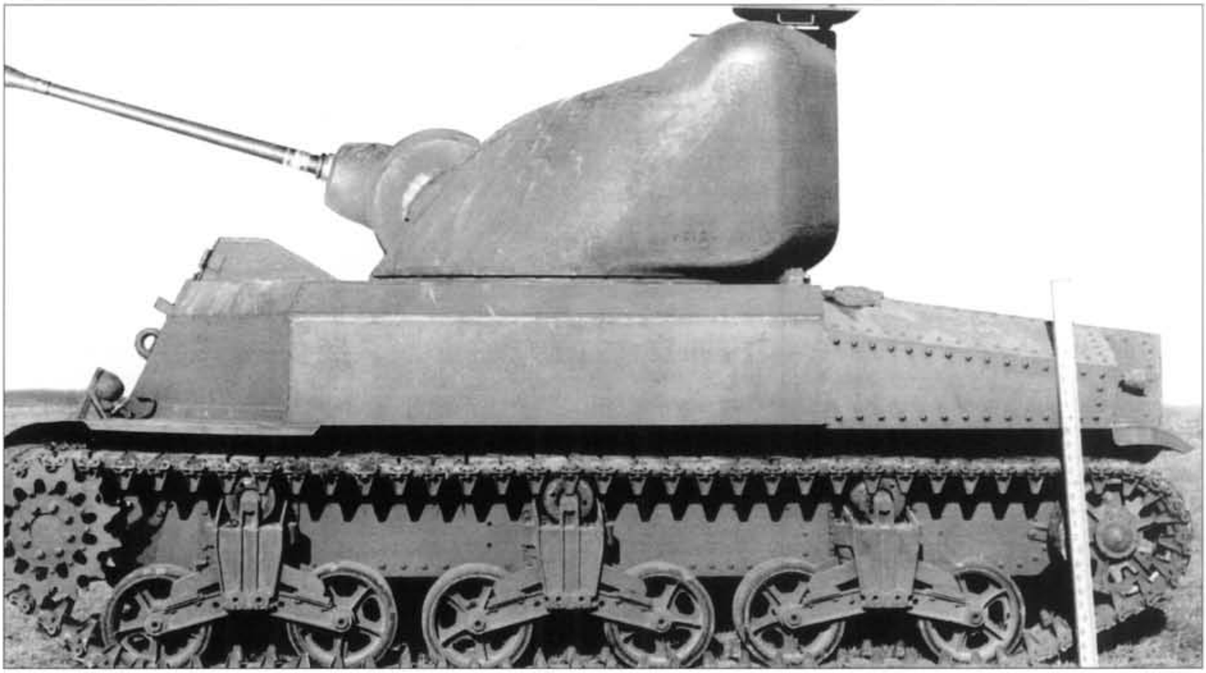
E1: GRANT CRUISER TANK, 22ND ARMOURED BRIGADE, GAZALA, MAY 1943

The Grant tanks taking part in the Gazala battles were mostly camouflage-painted in a simple scheme of Light Stone (BSC No. 61), a light tan color. The white registration number on the hull side was originally painted on the olive drab delivery scheme, and rather than re-paint it, as often as not it was left in white on the original olive drab background. Tactical markings were in the usual style, the circle indicating C



ABOVE **The M30 cargo carrier was built in parallel with the M12 to carry the 155mm ammunition, as seen here at the Erie Proving Ground in September 1942. (Patton Museum)**

BELOW **The T36 40mm GMC was an attempt to develop an antiaircraft vehicle on the M3 chassis. The complex fire-control problems associated with such a vehicle proved to be its downfall. (Patton Museum)**



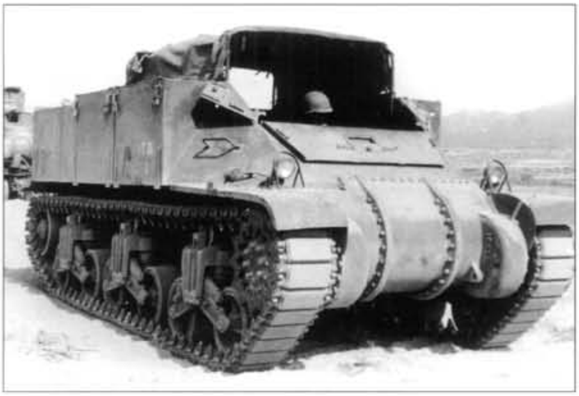
Squadron and the red color indicating the brigade's senior battalion/regiment. This marking was usually carried on either side of the turret, but photos taken after the fighting show some tanks with it in non-standard positions such as on the front left corner, and sometimes on the curved portion of the left front sand-shield. No arm of service markings or other unit markings are evident. Some Grants of the 3rd and 4th County of London Yeomanry began carrying an elaborate camouflage pattern developed by Captain Dick Sutton, which utilized local cement dyed brown, black and white, and applied like paint, but photos after the battle would suggest that this was far from universal at the time.

E2: GRANT CRUISER TANK, C SQUADRON, 3RD RTR, 4TH ARMOURED BRIGADE, 7TH ARMOURED DIVISION, GAZALA, MAY 1943

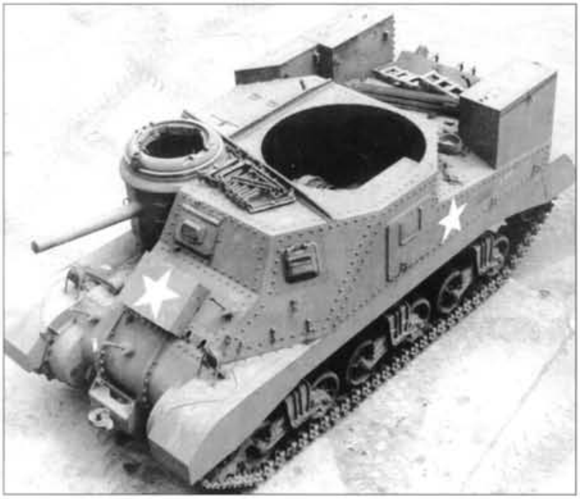
Unit commanders were given some discretion in the application of camouflage patterns in early 1942, and the 3rd RTR adopted a pattern of Light Stone over the lower portion of the tank, leaving the upper surfaces in the original olive drab. To break up the Light Stone, blotches of Purple-Brown were sprayed on. The turret tactical numbers are in yellow in the usual fashion. Many tanks in the unit had cartoon characters painted on the hull side, although this tank does not appear to.

F: CANAL DEFENSE LIGHT, 1ST TANK BRIGADE, 79TH ARMOURED DIVISION, 1944

The 79th Armoured Division's CDL tanks were finished in the usual SCC 15 olive drab, which was adopted in April 1944 to avoid the need to repaint US Lend-Lease equipment. The markings here are typical and include the divisional emblem, the tank name, and the A squadron tactical insignia. The specialized CDL brigade was disbanded in October 1944 and the regiments (11th, 42nd, 49th RTR) returned to normal tank status. A few CDL tanks were later operated by B Squadron, 49th Armoured Personnel Carrier Regiment (formerly 49th RTR).



ABOVE **The T16 prime mover was an initial attempt to develop an artillery prime mover using M3 medium tank components. The pilot is seen here on trials in the Mojave Desert in 1942. (NARA)**



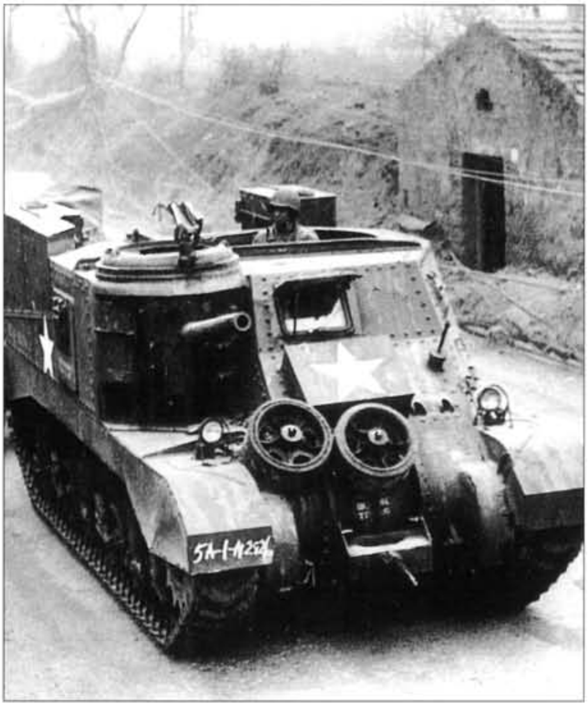
This overhead view of an M33 shows the many changes made between the M31 and M33, such as the ring mount over the false hull gun, and the front towing pintle. The M33 retained the internal winch of the M31 TRV. (Patton Museum)

G1: LEE CRUISER TANK, C SQUADRON, 3RD CARABINIERS, BURMA 1944

In early 1943, SCC13 Jungle Green was adopted for AFVs in the Far East, a dark, drab olive green. Tanks in Burma often carried large white Allied stars, but photos suggest that they were either overpainted with a slightly darker color or smeared with dirt or oil to reduce their visibility. The 3rd Carabinier Lees had a number of local modifications, such as the removal of the machine-gun cupola, additional rear stowage bins, and a screened frame over the engine deck to protect against Japanese hand-emplaced antitank mines.

G2: LEE CRUISER TANK, C SQUADRON, 150TH REGIMENT RAC, BURMA 1945

By 1945, Lees operating in Burma had additional local modifications, notably appliqué armor in the form of spare track links on the hull front and various welded plates on the hull side and sides of the engine compartment to protect against lunge-mines. The markings here are fairly typical, including a white Allied star, a vehicle name, and the usual tactical insignia at the 5 and 8 o'clock positions of the turret rear. On many tanks of the regiment, a yellow tiger was painted to the side of the driver's front visor, derived from the York and Lancaster's badge.



The M33 prime movers were used to tow the 8-inch gun or 240mm howitzer until the long-delayed M6 high-speed tractor became available. This example is seen near Mt Porchia in Italy on January 23, 1944. (NARA)

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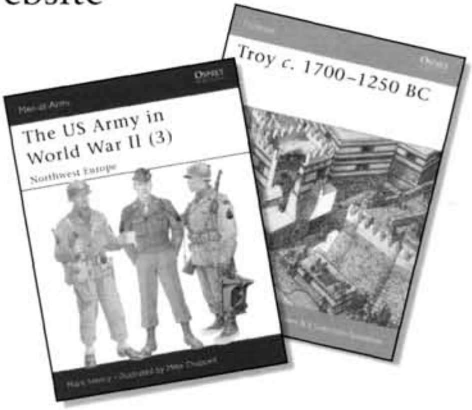

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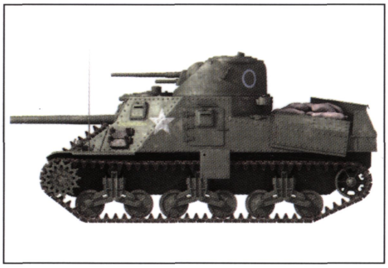

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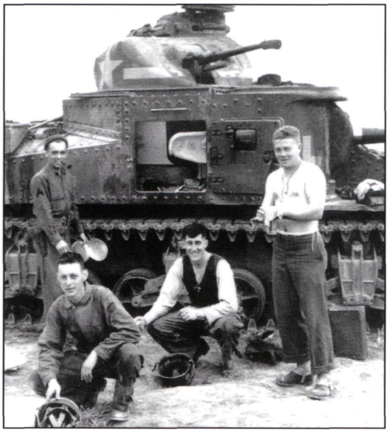

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M3 Lee/Grant Medium Tank 1941–45

The highly successful 'stop-gap' M3 medium tank was designed in 1941. As adequate turret casting facilities were not yet ready, the M3 used an unusual armament configuration patterned after a French tank. British lend-lease demands led to the design of a second turret type, with the US version called the Lee and the British version the Grant. It could penetrate Panzer armor, and its explosive firepower was excellent for dealing with German antitank guns. This book covers the design, development, service, and variants of a vehicle that was the backbone of many World War II forces.

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